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THE HOUSING QUALITY MODEL: A USER'S MANUAL

Second Edition

by

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1. INTRODUCTION

This manual describes the Housing Quality Model, a simulation package designed for analyzing the impacts of alternative policy scenarios on housing conditions in developing countries. The Housing Quality Model runs in a micro-computer environment; specifically, it is written in TURBO-Pascal (version 4.0), for PCs and PC compatibles.

This documentation is designed to achieve five major goals. First, we attempt to familiarize potential users with the Housing Quality Model. Therefore, chapter 2 provides a technical overview of the Model, including its basic input requirements, its assumptions, and its simulation methods. This overview is not intended to satisfy the curiosity of a programmer, but rather to enable analysts to understand the Model's strengths, weaknesses, and applicability to problems of policy analysis.

The second objective of the documentation is to introduce the user to the outputs that the Housing Quality Model produces, and to help users locate the results they are interested in among the model's various output tables. Chapter 3 provides a description of all the potential tables produced by the Housing Quality Model.

Our third objective is to define the Housing Quality Model's data requirements. These requirements are quite extensive, and generally necessitate analysis of a wide range of data sources. Chapter 4 identifies the Model's data sources, and provides worksheets for recording data items for subsequent entry into the Model.

Chapter 5 instructs users on the operation of the Housing Quality Model, providing step-by-step instructions for entering and modifying Model data files, and for running the Model when input files are complete. In addition, since a full application of the Model may require hundreds of data files, chapter 5 offers some suggestion on file management conventions. And finally, chapter 6 outlines the structure of the HQM computer programs for users who may wish to examine the code directly or to make modifications.

This document represents the <u>second edition</u> of the Housing Quality Model User's Manual. It includes changes in the solution algorithm, data requirements, and programming environment that were made in conjunction with the implementation of the HQM in Ecuador. Modifications were motivated by three key considerations. First, data on households and housing conditions in Ecuador were extremely limited, and it did not appear to be feasible to implement the Model for ten income deciles. Second, when we completed our initial simulations for Ecuador's two major urban areas (Quito and Guayaquil), we concluded that the Model's original treatment of net new households added each year was over

simplified and needed to be refined. And finally, a substantially revised version of the Turbo Pascal compiler was issued, enabling us to do away with some programming conventions which substantially reduced run times, and prevented us from adding new modules.

2. THE HOUSING QUALITY SIMULATION MODEL: TECHNICAL DESCRIPTION

This chapter describes the Housing Quality Model, which was designed to assist in the evaluation of alternative strategies for government intervention in the housing markets of developing countries. The Model can best be used in conjunction with the Housing Needs Assessment Methodology, which calculates the annual flow of resources required to bring all households to a designated quality standard over a ten- to twenty-year period. Once this level of resources has been estimated, policy makers are still faced with the problem of how best to deploy these funds, and may still be uncertain about how rapidly improvements in housing quality can be achieved.

The Housing Quality Model attempts to address these issues by simulating the changes in housing quality that would result from alternative intervention strategies. Before delving into the specifics of this model, we broadly define it in relation to other types of housing simulation models. First, the Housing Quality Model can best be understood as a record-keeping or accounting model, rather than as a behavioral model. While some behavioral assumptions are incorporated into the model, most must be explicitly supplied by users as part of the data entry process. Second, this is primarily a demand-side model, focusing on the capacity of households to achieve significant improvements in housing quality, either independently or through participation in publicly-sponsored assistance programs. Housing supply constraints are reflected in the cost of various housing options, and in interest rate trends, but the Model does not attempt to represent supply behavior endogenously or to simulate the market clearing process. Finally, the Housing Quality Model is designed to reflect, not a particular housing market, but the housing sector as a whole. However, in most applications, separate simulations will be conducted for urban and rural sectors, due to critical differences in housing problems, demographic trends, and feasible programs.

Four specific features of this model make it particularly useful for policy analysis in developing countries. First, it categorizes households by income, tenure, and dwelling quality, and analyzes transitions by households between tenure and dwelling quality classes under various government programs. Second, the model operates on an annual basis, so that alternative policies can be compared with respect to the rate at which housing improvements are achieved. Third, the model focuses on the transition of households from unacceptable dwelling and infrastructure conditions to acceptable conditions, rather than on more abstract, continuous measures of housing quality. Finally, in order to simulate specific government programs, the model requires analysts to formulate detailed specifications, encompassing eligibility requirements, funding levels, costs of participation, and assumptions about the

distribution of assistance among households. Experience with the Needs Assessment Methodology suggests that this process of policy formulation, which requires many assumptions to be made explicit, often proves to be as useful as the model results themselves.

In this section, we describe the model in considerable detail, including data requirements, solution steps, and model outputs. First, we outline the background transition components of the Housing Quality Model, which comprise the core of the simulation process. Then, we discuss the model's specification of housing assistance policies, including 1) expanded formal financing, 2) infrastructure upgrading and 3) sites and services or direct construction programs, and 4) policies to regularize tenure in squatter areas.

2.1 Simulating Background Transitions

The primary usefulness of the Housing Quality Model is as a tool for analyzing alternative strategies for government intervention in the housing sector. However, policy alternatives can best be assessed relative to a base case in which government plays a more limited role. Moreover, many dynamics affecting housing conditions and investment levels persist whether or not government intervenes to address a nation's housing problems. Therefore, the Housing Quality Model begins with a series of "no government," or "background" solution steps, which can then be supplemented by policy simulation steps.

2.1.1 Base-Period Household Data. The model's primary data structure is a three-dimensional matrix for classifying households. Each cell in the matrix represents the intersection of a particular income class, tenure category, and dwelling status. The model classifies households either by income quintile (five categories) or by income decile (ten categories).[1] Then, for each income group, households can fall into one of four tenure categories:

1) owner with clear title;

2) owner without clear title;

3) unit renter; or

4) room renter.

Within each tenure category, six dwelling statuses are possible, defined on the basis of both structural adequacy and infrastructure adequacy. These are:

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1. To simplify matters for the user, we have produced two versions of the model, one which allows for ten income categories and one which allows for only five.

1) structure and infrastructure both adequate;

2) structure adequate, infrastructure inadequate;

3) structure upgradeable, infrastructure adequate;

4) structure upgradeable, infrastructure inadequate;

5) structure inadequate, infrastructure adequate; or

6) both structure and infrastructure inadequate.

The definitions of structural and infrastructure adequacy will vary from one country to another, and will be obtained from the Housing Needs Assessment performed prior to implementation of the Housing Quality Model.

Using this income/tenure/dwelling status classification matrix to organize household data within the simulation model has two important advantages. First, it focuses on the differences among households that are of greatest importance to policy makers, and does not attempt to simulate the marginal effects of other, less critical, household attributes. At the same time, however, this approach avoids the problems of "lumpiness" found in some other housing simulation models, such as the Urban Institute Housing Market Simulation Model (Turner and Struyk, 1985). Specifically, since an actual number of households is entered into each cell in the classification matrix, and since any number of actual households can be shifted between cells, policies that affect only a small fraction of households can be accurately represented.

2.1.2 Annual Transitions Data. The model simulates four general types of background transitions. These represent changes that occur regardless of government housing activities, and that can affect the distribution of households across tenure and dwelling status categories as well as the allocation of resources within the housing sector. To simulate background housing quality transitions, the model requires exogenous estimates of the rates at which these changes occur.

In thinking about these data requirements, however, it is helpful to keep in mind that initial transition estimates will almost certainly be somewhat judgemental, and that they can be revised through a model calibration process. In other words, model users are required to come up with initial guesses at the various transition rates, and can then revise these guesses to make the resulting model outputs more consistent with other exogenous information about housing quality, new construction levels, and housing investment. Finally, it is important to note that the model concerns itself with net changes in the distribution of households across cells in the household classification matrix, not with the actual behavior of individual households moving between cells.

All of the transition data are in annual terms. The simplest application of the model would involve no changes in these transition rates from year to year. However, increases or decreases can be incorporated for any year in the simulation period if there is reason to expect such a discontinuity to occur. Moreover, as discussed further in a subsequent section, government policies can affect any or all of these transition data.

2.1.3 Solution Steps. The model operates on a year-by-year basis. In other words, it starts in an initial year with the base data provided, updates these data each year based on annual transition estimates, and reports the year's outcomes. Some cumulative totals are retained for reporting purposes, but, for the most part, each year's solution is self-contained. Therefore, this description of solution steps refers to a single year's simulation.

Adjust real incomes. Using the exogenously provided estimates of real income growth, the model inflates mean income for each income decile. If only a single growth rate is provided, mean income in each cell will change by the same amount. If, on the other hand, income growth varies by income class, all tenure/dwelling status cells within an income class will experience the same change in mean income. Note that, as real incomes increase, the implied values of "entry level" -- discussed below -- dwelling units also increase, since these values are based on affordability calculations.

Simulate net change in the number of households. This step uses exogenous estimates of the net change in the number of households to update the number of households requiring shelter of various types. The focus here is not on the dynamics of individual household mobility into and out of a sector or between cells in the household classification matrix. Rather, the model focuses on the net change in the number and resources of households seeking shelter.

As discussed earlier, a user of the model must specify the number of net new households for each income/tenure class. For all renter households, the model allocates new households across dwelling status categories, according to the base-year housing conditions among households in the same income-tenure category. In other words, if 50 percent of the renters in income group 1 initially occupy permanent units with unacceptable infrastructure, then 50 percent of the incoming renters in the same income category are assigned to this dwelling status each year.

Housing outcomes for owners are more explicitly sensitive to current housing costs and financing availability. Specifically, for owners (both with and without full documentation), the Model determines the maximum dwelling value that each category of newcomers can afford -- both with and without a conventional, market rate loan from the formal financial sector. The Model

attempts to assign newcomers in a given income-tenure category to the best dwelling status they can afford with formal financing. If formal financing is available for households in this income-tenure category occupying this type of dwelling, then the Model determines how many households can be served by the funds available, and assigns that number of households to the dwelling status.[1]

The Model repeats this process for all of the dwelling status categories that households in a given income-tenure class can afford and for which financing is available. If there are still unallocated newcomers in the income-tenure category, the Model assigns them to the dwelling status categories that they can afford without formal financing, or to the lowest dwelling status category, if none are affordable.

The background components of the Housing Quality Model assume that all households obtain at least an "entry level" unit for their assigned dwelling status. Therefore, in calculating the resource requirements generated by the addition of new households to the system, we assume that all newcomers have amassed sufficient resources to meet at least the entry cost of their assigned dwelling status, where the entry cost of each dwelling status is entered by the user. If the capitalized value of income available for housing investment is higher than the entry cost, households invest this higher amount, up to a ceiling of three times the entry cost.[2]

Each net newcomer to the housing sector generates a dwelling unit requirement as well as a resource requirement.[3] Dwelling unit requirements are recorded by tallying the total number of households entering and/or leaving each tenure/dwelling status category. To the degree that the number of incoming households exceeds the number of outgoing households for any dwelling status, the production of new dwelling units will be required. A

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1. This treatment represents a substantial change from the original version of the HQM. While this new treatment of newcomers to the housing sector complicates the Model significantly, it also substantially improves the Model's capacity to simulate deterioration in housing conditions, and it makes housing outcomes more sensitive to the volume and allocation of formal housing finance, even in the absence of explicit government loan programs.

2. This ceiling was imposed to limit the level of housing investment among the small number of affluent households living in poor housing circumstances.

3. Newcomers assigned to the "room renter" tenure category generate neither resource requirements nor new dwelling construction. They do, however, increase the incidence of crowding observed in the housing sector.

subsequent solution step is responsible for final calculations regarding the net level of new construction in each dwelling status category. At this stage, the model simply records additions to and subtractions from the number of dwelling units required to accommodate the households in each cell.

When this solution step is completed, each cell in the household classification matrix has an updated number of households, as well as data entries reflecting net new dwelling unit requirements and resource requirements generated by the addition of new households.

Simulate dwelling unit replacements. The next solution step is to estimate the resource requirements and new dwelling production levels necessary to replace units removed from the housing stock. Based on the distribution of dwelling units at the beginning of the current year, a fixed proportion of the units in each status must be replaced by new units.

The model computes replacements for each cell in the household classification matrix, incrementing the resource requirement and new dwelling tallies for that cell. Resource requirements are again set to the entry cost for the dwelling status, unless the capitalized value of income available for housing investment is higher. In this case, the higher value is used, up to a maximum of three times the entry cost. Replacements have no impact on the count of households in each classification cell.

Simulate dwelling status transitions. Based on the exogenously specified dwelling transition rates, the model shifts dwellings between cells, keeping track of owners' net resource requirements. Transitions are performed for one income/tenure category at a time. These transitions do not generate new dwelling unit production requirements, because they are all assumed to be accomplished by means of upgrading. In other words, for each transition, some number of units is simply subtracted from one dwelling status cell and added to another. However, these transitions do generate net resource requirements equal to the difference between the entry cost in the initial dwelling status and the investment level in the target status.[1] This effectively sets a household's "equity" in its prior dwelling status at the lower bound, and may therefore overestimate resource requirements necessary for upgrading units from one dwelling status to another.

Tabulate net new dwelling requirements. After all possible dwelling transitions have been accomplished, the model tallies up the total dwelling unit production requirements by tenure class and dwelling status. The results of this step will reflect new

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1. As before, the investment is at least the entry cost, and may be higher if the capitalized value of income available for housing investment is higher, up to a maximum of three times the entry cost.

construction levels and -- if applicable -- vacancy rates. Moreover, to the degree that units are vacant at the end of any year's solution, the model retains them for subsequent solutions. Thus, these units can be occupied by incoming households without creating the need for new construction in subsequent years. Vacant units are retained in the system for two full years before they start to decline in quality. Specifically, after standing vacant for two full years, permanent units become semi-permanent, semi-permanent units become improvised, and improvised units drop out of the stock.[1]

Compute total investment requirements. In its final background transition solution step, the model tallies up all private sector formal financing and savings/informal investment.[2] First, all resource requirements incurred by the owners of rental property are assumed to be generated from savings/informal financing. Then, owner-occupants' resource requirements are summed across cells in the household classification matrix, according to their use of formal finance versus savings/informal resource.

By definition, formal financing -- in the aggregate -- is constrained by the exogenously defined control totals. Savings/informal investment, on the other hand, may differ from exogenous estimates. At this point, a user can run the model (after incorporating policies that reflect the status quo) in an iterative calibration mode, to achieve transition rate assumptions and savings/informal investment totals that are consistent with one another and with exogenous evidence about how the housing stock has been changing and how much savings/informal finance households are able to mobilize for housing investment.

The issue of what is included in the Housing Quality Model's total investment measure is a difficult one. To the greatest degree possible, investment levels reflected in the Housing Quality Model are designed to correspond to national income accounts. However, an exact correspondance would require the

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1. Infrastructure acceptability does not decline during periods of vacancy.

2. Ideally, one would like to distinguish savings from informal financing. However, it is generally very difficult to make such a distinction, for two reasons. First, housing data bases do not always gather exhaustive information on financing other than from formal sources. Second, even when efforts are made to collect data on informal housing finance, difficulties are encountered differentiating intra-family lending from gifts or other reciprocal arrangements. Since intra-family sources often constitute the major share of informal financing, such definitional problems are significant. Therefore, the model is currently designed to lump savings and informal financing together. If reliable data could be generated to differentiate these two sources, the model could easily be refined to treat them separately.

exclusion from our totals of resources devoted to "unauthorized" upgrades and construction. The Housing Quality Model diverges from this treatment by including in its resource estimates any upgrades that shift a dwelling unit from one status to another as well as all new construction, even of unconventional units. Therefore, our estimates of housing investment levels will be higher than those generally reflected in national income accounts, but will still exclude incremental upgrades that do not change a unit's dwelling status.

It is very possible that a significant share of a nation's housing improvements may be achieved through continuous incremental upgrading that yields shifts in dwelling status only after a number of years. In such cases, the Housing Quality Model will actually come quite close to reflecting the true situation, since a small share of units will be shown to shift status each year, with the resource cost for each transitional unit roughly equal to the value of the accumulated upgrades required to achieve the transition. Only the resources invested by households in the highest dwelling status, who continue to upgrade their units incrementally will be entirely excluded from the model's calculations.

2.2 Simulating Government Activities

While the background transitions are an essential starting point for simulations, the real value of the Housing Quality Model is its capacity to simulate the effects of alternative strategies for deploying housing assistance resources. The Model simulates four broad classes of housing assistance programs:

1) Expansion of formal housing finance. This type of policy can take many forms, ranging from an increase in the volume of loans issued without any change in terms to a targeted lending program with subsidized interest rates.

2) Provision of infrastructure, with recipients paying a fixed proportion of the total cost. Earmarked financing could accompany such a program, or infrastructure recipients could be assumed to finance infrastructure and any accompanying structural improvements out of savings/informal financing.

3) Sites and services and/or direct construction projects. This category encompasses all programs in which the government sells sites offering adequate infrastructure accompanied by differing degrees of structure. Like the previous two types of policy, sites and services or direct construction may be accompanied by an earmarked pool of housing finance.

4) Regularized tenure projects, in which squatters and/or renters are offered title to the land they are occupying. Again, tenure regularization programs may be accompanied by earmarked loan pools to enable participants to finance the purchase of secure title.

For each of these types of activities, a user must specify in considerable detail how much assistance will be available, on what terms, and to what groups of households. On the basis of this exogenous information, the model then allocates the available assistance among households, and simulates the resulting transitions in tenure and dwelling status. Like the background transitions, these calculations are performed on a year-by-year basis, with each annual solution largely self-contained.

It is important to keep in mind that the policy components of the Housing Quality Model do not displace the background components. Instead, the background transitions are always simulated first, with any government activities essentially superimposed on top of the naturally occurring background transitions. A Model user may, however, wish to change some of the data elements required by the Model's background components in light of policies being simulated. For example, a policy of financial reform would be expected to change interest rates throughout the housing sector, while other policies might affect income growth rates.

Although the data requirements and solution steps differ somewhat for the various types of government intervention, all four share the same basic solution algorithm. We describe this basic algorithm, and then outline the unique characteristics of each type of government policy. Finally, we show how these can be combined into an overall housing assistance strategy.

2.2.1 Policy Solution Steps. For each type of government policy, the user must specify the volume of assistance available, the required household investment, loan terms, the amount of the government subsidy, the dwelling status households must achieve in order to participate, and the level of savings/informal finance households can be expected to mobilize in response to this opportunity. In addition, the user indicates which cells in the household classification matrix are eligible to participate in the policy.

Based on this information, the Model implements a four-step process for simulating policy outcomes:

1) Confirm that all eligible households can afford to meet lending requirements, and that the number of households designated to participate in a program does not exceed the total number of households in any cell. In this step, the model considers each eligible cell in the household classification matrix to ensure that households in this cell can afford to satisfy the minimum requirements of the program. For example, a low-income group might be designated as eligible even though its income is too small to support a mortgage loan at the specified terms. The model tests for affordability both to ensure that households have enough income (adjusted for expenditures on other essential items) to meet loan payments, and to ensure that

they can generate sufficient savings/informal finance to meet minimum downpayment requirements. Equity from the previous dwelling is considered in this affordability test, if applicable. If some cells designated as eligible by the user cannot afford to participate in the program, the model reallocates the original pool of loans among the remaining eligible cells.

2) Allocate the units of assistance available across cells according to the proportionate allocation scheme specified by the user, as modified to reflect ineligibility or unavailability of households in some cells.

3) Simulate tenure and dwelling status transitions resulting from the loans dispensed. This step is performed for each cell receiving assistance. If the number of units of assistance allocated to a particular cell is equal to one tenth of the number of households in that cell, then one tenth of the households are assumed to participate. Based on the income available for housing investment for households in the cell, and on the maximum level of savings/informal finance that households are assumed to mobilize, the model calculates the maximum affordable loan and maximum dwelling value under the terms of the financing program. Recipient households are then shifted into the highest tenure/dwelling status category they can afford.

4) Increment investment and new construction totals. Based on the level of participation in the program, and on the changes in dwelling status achieved by participants, the model computes the number of new dwellings built and the total level of housing investment made as a result of the program.

2.2.2 Expansion of Formal Finance. The expansion of formal loans for housing can take many forms. At one extreme, government policies could work to expand the volume of loans available and could continue to allow existing private lenders to allocate these funds with no change in lending practices or terms. At the other extreme, government could take on the role of raising and lending funds for housing investment, subsidizing interest rates and targetting loans to households not already served by private lenders. Of course, many possible approaches to the expansion of formal housing finance lie between these two extremes. The Housing Quality Model has the capacity to simulate the expansion of formal finance on any terms. In fact, it is possible to specify more than one pool of formal loans, with different lending practices and terms associated with each.

To permit this kind of flexibility, the model must rely on the user for a detailed specification of how each pool of formal loans is to be allocated and on what terms. Exhibit 2.1 identifies the loan terms that must be specified by the user. Most of these terms are self-explanatory, but a few merit additional discussion. The market rate of interest should

reflect the actual cost of funds to the lender. In combination with the programmatic interest rate, this market rate is used to

EXHIBIT 2.1:
LOAN TERMS FOR EXPANDED FORMAL FINANCE POLICY

Aggregate Amount of Loanable Funds Available
Program Interest Rate (annual)
Market Interest Rate
Repayment Period (in years)
Estimated Average Loan Amount
Max. Savings/Informal Mobilization
Required Dwelling Status after Participation
Minimum Dwelling Value after Participation
Maximum Loan Amount
Maximum Loan to Value Ratio

compute the amount of interest subsidies, if any. The maximum savings/informal mobilization rate represents the maximum downpayment households can be expected to raise from savings and informal financing in response to the program's opportunity. This rate represents a share of annual income. Finally, the required dwelling status identifies the lowest dwelling status participants can occupy -- in this case, a permanent structure with acceptable infrastructure.

In addition to these loan terms, a user must specify the expected allocation of loans among the cells in the household classification matrix. In other words, what share of loans are expected to go to each income/tenure/dwelling status cell? The allocation matrix should reflect not only program eligibility requirements, but also reasonable expectations about participation rates and leakage.

Based on the user's specification of formal financing terms and eligibility, the model allocates the available funds among eligible households and records the resulting changes in tenure and dwelling status, using the basic solution process outlined above.

2.2.3 Provision of Infrastructure. Policies of this kind involve government provision of adequate infrastructure services to areas lacking such services. To participate, a household must pay a fixed portion of the cost of the infrastructure provided, and all recipients are assumed to shift to an "adequate infrastructure" dwelling status. In addition, some recipients will presumably be prompted to raise sufficient funds to achieve meaningful improvements in dwelling quality as well, thereby shifting from semi-permanent to permanent dwelling units.

Infrastructure programs may be accompanied by earmarked pools of formal financing. If earmarked loans accompany the provision of infrastructure services, all participants are assumed to receive loans. If formal financing is not explicitly provided in

conjunction with the infrastructure program, recipients are assumed to finance infrastructure improvements as well as any accompanying structural improvements entirely out of savings/informal finance.

The specification of this type of policy assumes that all participants begin with inadequate infrastructure and end up with adequate infrastructure. Beyond these two built-in assumptions, the user controls the allocation of assistance, and the terms of any earmarked financing available. Exhibit 2.2 presents the program terms a user must specify each year for an infrastructure program. The cost of a structural upgrade refers to the additional costs participants must incur to convert semi-permanent dwelling units to permanent status. Some participants will be able to afford such upgrades immediately. Of those that

EXHIBIT 2.2:
TERMS FOR INFRASTRUCTURE POLICY

Number of Units Programmed for Services
Required Household Contribution
Government Grant
Cost of Structural Upgrade
Share of Participants Achieving
Structural Upgrade After 1 Year
2 Years
3 Years
4 Years
5 Years
Maximum Savings/Informal Mobilization
Terms for Earmarked Loans

cannot, the user specifies the share expected to make this transition in each of the subsequent five years. As for formal finance policies, infrastructure program terms must be accompanied by the expected allocation of assistance among cells in the household classification matrix.

Based on the user's specification of the allocation and effectiveness of infrastructure assistance, the model dispenses the available funds by providing adequate infrastructure to eligible households, and records the resulting changes in dwelling status. No changes in tenure status are assumed to occur.

2.2.4 Sites and Services or Direct Construction. This type of policy encompasses a fairly wide range of programs, all of which include the sale of fully-serviced sites to participating households. Under a sites and services program, a partial structure may also be provided, or only a foundation and "wet core" for subsequent construction. Under a direct construction program, a fully adequate dwelling unit is completely constructed before a household purchases the site. Thus, fully adequate infrastructure is always provided automatically, while the amount

of incremental investment required to achieve full structural adequacy differs between program variants. For any particular sites and services or direct construction program, the cost to participants is assumed to be fixed. As for infrastructure policies, earmarked financing may accompany a sites and services or direct construction program. Otherwise, households' investment in their new properties are assumed to be obtained entirely from savings/informal financing. Because several variants of this policy type are possible, users can call for the implementation of more than one sites and services or direct construction program at the same time. Thus, a particular year's housing intervention strategy might include a direct construction program targetted to one income group as well as a sites and services program targetted to lower income households.

Exhibit 2.3 presents the program terms that a user must specify. As in the previously described policies, the model allocates the available sites among eligible households according to the user's specifications, and records the resulting tenure and dwelling status changes.

EXHIBIT 2.3:
TERMS FOR SITES AND SERVICES POLICY

Number of Units Programmed
Required Household Contribution
Government Grant per Unit
Target Dwelling Status
Target Tenure
Cost of Structural Upgrade
Share of Participants Achieving
Structural Upgrade After 1 Year
2 Years
3 Years
4 Years
5 Years
Maximum Savings/Informal Mobilization
Terms for Earmarked Loans

2.2.5 Regularization of Tenure. Policies of this kind involve government provision of secure tenure to squatters and/or renter households for the properties they are currently occupying. To participate, a household must pay a portion of the land cost, and all recipients are assumed to shift to a "secure owner" tenure status. In addition, some recipients will presumably be prompted to raise sufficient funds to achieve meaningful improvements in dwelling quality as well, thereby shifting from semi-permanent to permanent dwelling units.

Tenure programs may be accompanied by earmarked pools of formal financing. If earmarked loans accompany the provision of secure tenure, all participants are assumed to receive loans. If formal financing is not explicitly provided in conjunction with the

infrastructure program, recipients are assumed to finance their land purchases as well as any accompanying structural improvements entirely out of savings/informal finance.

The specification of this type of policy assumes that all participants begin as squatters or unit renters and end up as secure owners. Beyond these two built-in assumptions, the user controls the allocation of assistance, and the terms of any earmarked financing available. Exhibit 2.4 presents the program terms a user must specify each year for an tenure regularization program. The cost of a structural upgrade refers to the additional costs participants must incur to convert semi-

EXHIBIT 2.4:
TERMS FOR TENURE POLICY

Number of Units Programmed
Required Household Contribution
Government Grant
Cost of Structural Upgrade
Share of Participants Achieving
Structural Upgrade After 1 Year
2 Years
3 Years
4 Years
5 Years
Maximum Savings/Informal Mobilization
Earmarked Loan Terms

permanent dwelling units to permanent status. Some participants will be able to afford such upgrades immediately. Of those that cannot, the user specifies the share expected to make this transition in each of the subsequent five years. As for all other policies, tenure program terms must be accompanied by the expected allocation of assistance among cells in the household classification matrix.

Based on the user's specification of the allocation and effectiveness of tenure regularization, the model dispenses the available funds by providing secure tenure to eligible households, and records the resulting changes in tenure and dwelling status.

2.2.6 Simulating a Comprehensive Housing Assistance Strategy. Given the capability to implement various types of housing policy, how does the model simulate a comprehensive strategy for deploying housing resources?

As a general rule, policies should be viewed as supplementing background transitions. In other words, the background components of the model are always solved first, and then the incremental impacts of public policies are simulated. Policies specified by the user are implemented one-by-one in each

simulation year. The model keeps track of the number of households in each cell that have received each form of assistance, including formal financing. In addition, the model records the number of households achieving fully acceptable housing through participation in each policy. This includes all participants who shift from unacceptable dwellings and/or infrastructure to fully acceptable units.

The model's annual solution algorithm will make it possible to specify an almost infinite variety of policy combinations. To illustrate, a user might define a housing assistance strategy calling for major structural reforms in the financial system. During the initial years, when these structural reforms would be taking place, reliance might be placed on direct public subsidy mechanisms, such as infrastructure upgrading or sites and services programs. Gradually, as the capacity of the financial system expanded, emphasis might shift toward programs relying on private sector formal financing for all but the lowest income groups. Another example of the model's potential flexibility, mentioned earlier, could involve the specification of several formal financing pools or several sites and services programs, each targeted at a particular group of households.

For any package of housing assistance programs, the model generates annual tables showing of the number of households participating and the number of households achieving improvements in dwelling status. These estimates are provided for each program and for the combination of programs in operation in any given year. In addition, counts of households achieving upgrades due to past program participation are also provided annually. In addition to these annual tables, the model produces a cumulative summary of total year-by-year participation in government programs. Finally, for any housing assistance strategy specified, the model reports total resource requirements, the relative contribution of formal financing, government subsidies, and savings/informal financing to housing sector resources, and year-end distributions of households by tenure and dwelling status for each income quintile.

3. UNDERSTANDING THE MODEL RESULTS

The Housing Quality Model can generate an enormous volume of output, including an extensive set of tables for each year in the simulation period and a more limited set of tables summarizing the simulation period as a whole. As explained in chapter 4, simulation control files will tell the model which annual tables to display on your screen or to print as it completes each year in the simulation period. Thus, you can select some or all of these tables to be produced every year, or every perhaps every fifth year, depending on how you plan to structure your analysis of housing quality changes. The summary tables, which present results for the simulation period as a whole, are printed automatically at the end of a simulation.

This chapter provides some guidance for users attempting to find their way through these tables. Specifically, we provide examples of all the tables produced by the Housing Quality Model, describing both their content and their organization. We begin with the tables that can be generated for each year in the simulation period, and then describe the summary tables that are automatically printed at the end of a simulation. A complete set of output tables is provided in Annex B.

3.1 Annual Output Tables

The Housing Quality Model's annual output tables fall into three broad classes: 1) tables that describe housing outcomes regardless of the policy scenario in effect; 2) tables that describe the impacts of specific policies that are in effect; and 3) tables that describe the impacts of the overall policy package that is in effect. We now discuss each of these classes of output tables in turn.

3.1.1 Housing Outcomes. The first set of annual output tables describe housing conditions at the end of any simulation year. Policies will affect these outcomes, but the tables can be produced regardless of the policy scenario in effect, and outcomes are not explicitly attributed to particular policies. Nine output tables fall into this category:

Total Resource Requirements. This table presents the Housing Quality Model's estimates of the total investment resources devoted to housing for the sector in the current year. In other words, given the policy scenario in effect, what is the total level of investment required for the housing quality transitions simulated by the Model? The table reports the share of this total resource requirement contributed by formal finance, savings/informal finance, and government subsidies. Finally, investment from each of these sources is allocated between owner-occupants and unit landlords.

Savings/Informal Finance with Title and Savings/Informal Finance without Title. These two tables report levels of savings/informal finance (presented as a share of annual

income) for secure owners and squatters, respectively. In other words, given the policy scenario in effect, and the housing quality transitions simulated for the year, how much are owners in each decile mobilizing from savings/informal sources? Entries in these two tables can take on rather strange values. Among low income groups, savings/informal mobilization rates are sometimes extremely high, generally because the model records in a single year transitions that may have been accomplished incrementally over a number of years. By contrast, mobilization rates among high income owners are sometimes negative, reflecting the fact that conventional formal finance is narrowly targetted to high income households, and that the Model may underestimate their total housing investment.

Net New Dwelling Units Constructed. This table reports the number of new units added to each dwelling status category, net of units dropping out of the stock. Given the transitions simulated for the year, how many units were added to the housing stock for the sector, and how were these units distributed by structure quality and infrastructure adequacy? This table can be used to determine the condition of units being added to the housing stock under alternative policy scenarios. Are most new units structurally adequate and equipped with acceptable infrastructure services, or is the bulk of new construction low quality and lacking in infrastructure services?

Dwelling Units Vacant. These table reports the number of units in each dwelling status category that are vacant at the end of the simulation year. These vacancies reflect the extent to which net additions to the housing stock exceed net household growth; they do not reflect the level of vacancies that would naturally exist in the housing market to accomodate household turnover. Vacant units can be returned to occupancy in subsequent simulation years, although the Model simulates a process of gradual deterioration among vacant units and ultimately drops them from the available stock.

Room Renters by Dwelling Status and Room Renters by Income Class. These two tables report the total number of households renting rooms in occupied dwelling units, and the distribution of these households first by dwelling status and then by income decile. In other words, at the end of the simulation year, how many households are -- in effect -- doubled up? What is the condition of the housing units occupied by these room renters and what are their income levels?

Households by Income and Tenure. This table presents the distribution of households by income and tenure at the end of the simulation year. In other words, given the policy scenario in effect and the transitions simulated by the Model, how are households distributed by income and tenure

at the end of the year? This table can be useful for determining how alternative policy scenarios compare in terms of the share of households achieving secure ownership or the share who are squatters or room renters.

Households by Income and Dwelling Status. This table presents the distribution of households by income and dwelling status at the end of the simulation year. Given the policy scenario in effect and the transitions simulated by the Model, how are households distributed by income and dwelling status (structure quality and infrastructure adequacy) at the end of the year. This is likely to be one of the most important annual outputs of the Housing Quality Model, since successive annual tables can be used to track changes in the condition of the sector's housing stock. Under alternative policy scenarios, is the share of fully adequate housing growing? Is significant progress being made at reducing the share of households -- and particularly low income households -- who are consigned to unacceptable housing conditions?

3.1.2 Individual Policy Outcomes. The next set of annual tables documents the impacts of the specific policies simulated in a given year. The Housing Quality Model can produce a table documenting the impacts of each formal finance policy in effect, each infrastructure policy, each sites and services or direct construction policy, and each tenure policy. Each of these policy tables reports the number of participants, and the distribution of participants by income quintile. In addition, each table reports the number and distribution of households achieving fully acceptable dwelling conditions as a result of their participation. In other words, for any policy, some participants may already occupy fully adequate housing, and others may not be able to afford fully adequate conditions despite their participation. This table indicates how effective each policy is at shifting households from inadequate to fully adequate housing conditions, and how program beneficiaries are distributed by income class.

3.1.3 Overall Policy Outcomes. The final set of annual tables reports on the overall impacts of the complete package of policies in effect for a given year. The first table in this category is comparable to the individual policy tables described above. For the package of policies in effect, this table presents the total number of participants, and the distribution of participants by income quintile. In addition, the table reports the number and distribution of households achieving fully acceptable dwelling conditions as a result of their participation in one of the policies in effect for the year. This table indicates how effective the total policy package is at shifting households from inadequate to fully adequate housing, and reports the distribution of policy beneficiaries by income class.

The second table describing overall policy outcomes reports the number and distribution of households achieving fully adequate housing as a result of program participation in an earlier simulation year. As explained in Chapter 2, the Model assumes that some participants in programs offering regularized tenure, sites and services, or infrastructure upgrading may not be able to afford to upgrade their dwelling units to fully adequate condition in the year of program participation. However, in subsequent years, a share of these households can be scheduled to achieve fully acceptable housing through the incremental investment of savings/informal resources. These scheduled upgrades are reported in the year in which they occur.

3.2 Summary Output Tables

Three tables are automatically produced at the end of a complete simulation period, summarizing key results of the simulation as a whole. These three tables present the information that we have found to be most useful for drawing conclusions about overall simulation results. However, each application of the Housing Quality Model will have a unique focus, and may therefore emphasize different aspects of the Model's simulation results. Therefore, you may find it necessary to extract the summary information that if most relevant for your analysis from one or more of the annual output tables described earlier in this chapter. The remainder of this section describes each of the summary output tables in turn.

Annual Resource Requirements. This table presents the Housing Quality Model's estimates of the total investment resources devoted to housing for the sector in each year of the simulation period. In other words, given the policy scenario in effect, what is the total level of investment required for the housing quality transitions simulated by the Model? The table reports the share of this total resource requirement contributed by formal finance, savings/informal finance, and government subsidies. Finally, investment from each of these sources is allocated between owner-occupants and unit landlords.

Increase in Fully Adequate Units. This table summarizes the improvement in housing quality over the simulation period by presenting the number and percent of fully adequate units at the beginning and end of the simulation period, as well as the total increase and the increase in the share of fully adequate housing units. In addition, the table presents the distribution of fully adequate units across income deciles at the start and end of the simulation period, and shows how the increase in the share of fully adequate units varies by income class.

Measures of Efficiency. This table presents eight key measures of housing policy efficiency for the simulation period as a whole. These measures include the following:

1) the aggregate housing investment for the simulation period;

2) the aggregate increase in the number of fully acceptable dwelling units;

3) the total investment per new acceptable unit (item #1 divided by item #2);

4) the total government subsidy per new acceptable unit (aggregate government subsidies divided by item #2);

5) the aggregate number of policy participants;

6) the aggregate level of program expenditures, including loans as well as grants;

7) the total program expenditure per program participant (item #6 divided by item #5); and

8) the shares of aggregate housing investment contributed by the formal financial sector and government subsidies.

4. PREPARING DATA INPUTS FOR THE HOUSING QUALITY MODEL

This section defines the Housing Quality Model's data requirements, identifies possible sources or techniques for generating these data, and provides worksheets for recording data elements as they are prepared. The section consists of three parts. First, we define base year input requirements; second we define annual background transition data; and finally, we define the data needed for various types of policy simulations. Chapter 4 explains how to create the data files on the micro-computer from the data worksheets presented in this section, and how to run the Housing Quality Model once these data files have been created.

4.1 Base Year Data Requirements

The Housing Quality Model's base year data requirements fall into six basic categories:

1) Average income by either quintile or decile

2) Share of income available for housing by quintile or decile

3) Number of households by quintile or decile

4) Joint distribution of households by quintile or decile, tenure, and dwelling status

5) Entry costs for each dwelling status

6) Savings/informal finance mobilization rate

Each of these requirements is now defined more completely in turn, and worksheets are provided for recording data elements as they are generated. Note that all the worksheets provide space for ten income categories. If you are implementing the model with only five income categories, just ignore the extra cells.

4.1.1 Income by quintile or decile. For each income group, estimate the mean household income in the base year of your simulation. As in the Housing Needs Assessment Model, these average income figures should reflect income from all sources, including in-kind contributions of goods and services. In many countries, incomes are consistently underreported in household surveys, and it may be necessary to adjust reported estimates upward, possibly using national accounts data. Note that if you multiply each decile's mean income by the number of households in the decile, and add up all of these products, the total should correspond roughly to estimates of total consumer expenditures for the sector in the national income accounts.

Base Year Input Worksheet #1:
Mean Income by Quintile or Decile
(in currency units)

Decile 1:	_____
Decile 2:	_____
Decile 3:	_____
Decile 4:	_____
Decile 5:	_____
Decile 6:	_____
Decile 7:	_____
Decile 8:	_____
Decile 9:	_____
Decile 10:	_____

4.1.2 Share of income available for housing investment. For each income group, enter the share of income that is available for capital improvements or debt repayment for housing. In other words, estimate the total share of income available for housing, and then adjust this downward to reflect housing expenditures for day-to-day maintenance and operations. The value of contributed labor and materials should be included in your estimates of total housing expenditures, if possible. The idea is to generate the best possible estimate of the resources households can marshall on a regular basis for housing investment.

These housing expense to income ratios are calculated for each quintile for the Housing Needs Assessment Model, and each of the quintile values can be entered for the corresponding two deciles, if necessary.

Base Year Input Worksheet #2:
Share of Income Available for Housing
(decimal numbers less than 1.0)

Decile 1:	_____
Decile 2:	_____
Decile 3:	_____
Decile 4:	_____
Decile 5:	_____
Decile 6:	_____
Decile 7:	_____
Decile 8:	_____
Decile 9:	_____
Decile 10:	_____

4.1.3 Number of Households by Quintile or Decile. Enter the total number of households in each decile. The number will probably be the same for each decile, but it is possible to define income classes of differing size. Note, however, that if you redefine income classes in this way, other inputs -- particularly income -- would also have to be adjusted. The number of households in each decile should sum to the total households in the sector.

Base Year Input Worksheet #3:
Number of Households in each Quintile or Decile
(actual number)

Same number in each decile: _____

OR

Decile 1: _____
Decile 2: _____
Decile 3: _____
Decile 4: _____
Decile 5: _____
Decile 6: _____
Decile 7: _____
Decile 8: _____
Decile 9: _____
Decile 10: _____

4.1.4 Distribution of households by income, tenure, dwelling status. For each income group, enter the joint distribution of households by tenure and dwelling status. In each income group, your entries must sum to 100 percent. Generating these distributions almost certainly requires access to household survey data, in which households have been asked about their incomes, tenure, and housing conditions. If no data set containing all of the relevant information items is available, it is necessary to piece together the necessary distributions from independent data sources. For example, one data set may provide cross-tabulations of income by tenure and house value, while another provides the distribution of house values by dwelling quality and infrastructure categories. After generating an estimated distribution of households by income, tenure, and dwelling status, the analyst should discuss the results with knowledgeable individuals in the public and private sector and make any further adjustments that seem warranted.

Base Year Input Worksheet #4:
Distribution of Households by Tenure and Dwelling Status in each Quintile or Decile
(percentages)

Decile 1:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	____	____	____	____	____	____
Squatters:	____	____	____	____	____	____
Unit Renters:	____	____	____	____	____	____
Room Renters:	____	____	____	____	____	____

Decile 2:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	____	____	____	____	____	____
Squatters:	____	____	____	____	____	____
Unit Renters:	____	____	____	____	____	____
Room Renters:	____	____	____	____	____	____

Decile 3:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	____	____	____	____	____	____
Squatters:	____	____	____	____	____	____
Unit Renters:	____	____	____	____	____	____
Room Renters:	____	____	____	____	____	____

Decile 4:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	____	____	____	____	____	____
Squatters:	____	____	____	____	____	____
Unit Renters:	____	____	____	____	____	____
Room Renters:	____	____	____	____	____	____

Decile 5:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:						
Squatters:						
Unit Renters:						
Room Renters:						

Decile 6:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:						
Squatters:						
Unit Renters:						
Room Renters:						

Decile 7:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:						
Squatters:						
Unit Renters:						
Room Renters:						

Decile 8:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:						
Squatters:						
Unit Renters:						
Room Renters:						

Decile 9:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:						
Squatters:						
Unit Renters:						
Room Renters:						

Decile 10:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:						
Squatters:						
Unit Renters:						
Room Renters:						

4.1.5 Entry costs by dwelling status. Enter the minimum value (or purchase price) of dwellings in each status category. These entry costs represent the minimum levels of investment required to purchase each type of housing unit. In other words, the entry cost for a particular status should reflect the lowest purchase price for dwellings of that status.

Base Year Input Worksheet #5:
Entry Costs by Dwelling Status
(currency units)

Permanent Structure	
Infrastructure Passes	
Infrastructure Fails	_____
Semi-Permanent Structure	_____
Infrastructure Passes	
Infrastructure Fails	_____
Improvised Structure	_____
Infrastructure Passes	
Infrastructure Fails	_____
	_____

4.1.6 Savings/informal finance mobilization rate. Enter the fraction of annual income that households can typically be expected to mobilize from savings and informal financing sources. For example, if households are expected to be able to mobilize the equivalent of about 3 months income for housing investment, enter 0.25.

Base Year Input Worksheet #6:
Savings/Informal Mobiliation Rate
(decimal number, less than 1.0)

Share of Annual Income Mobilized from Savings/Informal	_____

4.2 Annual Background Transitions Data

The next group of input requirements govern the Housing Quality Model's simulation of year-to-year background transitions -- transitions that occur regardless of the policies being simulated. A full set of background transitions data must be provided for each year in the simulation period. This makes it possible to model the effects of discontinuous demographic or economic trends. Simpler simulations, however, may reflect smoother forecasts, in which case all of the annual data sets may be the same. Chapter 4 shows how annual data files can be duplicated in such instances.

Annual background transitions data consist of nine basic requirements:

1) Income growth by quintile or decile

2) Number of new households by quintile or decile

3) Tenure distribution of new households

4) Existing dwelling transition rates

5) Interest rate

6) Replacement rate

7) Dwelling Cost Inflation Rate

8) Volume of formal financing

9) Allocation of formal financing

Each of these requirements is now defined more fully, with worksheets for recording the full set of inputs for a single year in the solution period.

4.2.1 Income growth by quintile or decile. Estimate the annual rate of increase in real incomes. In other words, how much will the mean income of each group increase (or decline) exclusive of the effects of inflation. A single growth rate can be entered to apply to all income groups, or different groups can experience different rates of income growth. Using a single growth rate for all deciles implies that you do not anticipate significant shifts in the overall income distribution.

Annual Transition Data Worksheet #1:
Income Growth by Quintile or Decile
(decimal numbers)

Same rate for each decile: _____

OR

Decile 1: _____
Decile 2: _____
Decile 3: _____
Decile 4: _____
Decile 5: _____
Decile 6: _____
Decile 7: _____
Decile 8: _____
Decile 9: _____
Decile 10: _____

4.2.2 Number of new households by quintile or decile. Enter the net increase (or decrease) in the number of households in each income group. In other words, how is the size of each group expected to change as a result of in- and out-migration from the sector, new household formation, and shifts by households between income deciles. If there is no reason to anticipate significant changes in the sector's income distribution, then a single number can be entered for all groups -- the total increase in households expected for the year divided by 5 for quintiles or 10 for deciles. Negative numbers can be entered for any or all deciles if the sector is expected to experience net population losses.

Annual Transition Data Worksheet #2:
Increase in Households by Quintile or Decile
(actual numbers)

Same number for each decile: _____

OR

Decile 1: _____
Decile 2: _____
Decile 3: _____
Decile 4: _____
Decile 5: _____
Decile 6: _____
Decile 7: _____
Decile 8: _____
Decile 9: _____
Decile 10: _____

4.2.3 Tenure distribution of new households. For each income group, enter the share of new households in each tenure category. To illustrate, you might indicate that low income newcomers to the sector are expected to be either room renters or squatters, while affluent newcomers are most likely to become secure owners. Alternatively, you might assume that the tenure distribution of newcomers mirrors the tenure distribution of existing households in the sector.

Annual Transition Data Worksheet #3:
Tenure Distribution of New Households by Quintile or Decile
(decimal numbers)

	Secure Owners	Squatters	Unit Renters	Room Renters
Decile 1:	_____	_____	_____	_____
Decile 2:	_____	_____	_____	_____
Decile 3:	_____	_____	_____	_____
Decile 4:	_____	_____	_____	_____
Decile 5:	_____	_____	_____	_____
Decile 6:	_____	_____	_____	_____
Decile 7:	_____	_____	_____	_____
Decile 8:	_____	_____	_____	_____
Decile 9:	_____	_____	_____	_____
Decile 10:	_____	_____	_____	_____

4.2.4 Existing dwelling transition rates. For each dwelling status, enter the share of units expected to shift upward to another dwelling status within the year. Some status-to-status shifts are unlikely, and the values in these cells can be 0.0. For example, in the absence of government upgrading programs, it is difficult for households to achieve fully adequate infrastructure services. In addition, improvised units are typically defined as structures that cannot reasonably be upgraded. If this is the case, then we would expect no upward transitions from these status categories. Note, that the depreciation of existing dwelling units is simulated separately; these data deal with upward transitions only.

Estimating these transition rates can be very difficult. One possible approach is to compare successive Censuses to determine how the quality distribution changes for a fixed cohort of dwelling units. However, this level of detail may not be available from published data sources, and you may have to rely on the estimates of knowledgeable observers of local housing conditions.

Annual Transition Data Worksheet #4:
Dwelling Status Transition Matrix
(decimal numbers)

Start of Yr Status Categories:	End of Year Status Categories: Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Perm-Pass	0.0	0.0	0.0	0.0	0.0	0.0
Perm-Fail	_____	0.0	0.0	0.0	0.0	0.0
Semi-Pass	_____	_____	0.0	0.0	0.0	0.0
Semi-Fail	_____	_____	_____	0.0	0.0	0.0
Imp-Pass	_____	_____	_____	_____	0.0	0.0
Imp-Fail	_____	_____	_____	_____	_____	0.0

4.2.5 Interest rate, dwelling replacement rate, and dwelling cost inflation rate. For the interest rate, enter the annual rate for capitalizing income available for housing investment. This should generally correspond to the interest rate used in base case runs of the Housing Needs Assessment Model. In an environment where mortgage loans are readily available, the prevailing, nominal interest rate for mortgages would be the appropriate data item to enter here. However, where a large share of households rely on savings/informal financing sources or on incremental upgrading, it is less obvious what the appropriate interest rate should be. Also note that, while the Needs Assessment Model uses a single, fixed interest rate for its twenty-year solution period, the Housing Quality Model allows you to enter a different interest rate each year.

For the replacement rate, enter the proportion of units expected to drop out of the stock each year -- due to natural disasters or demolitions, but also due to gradual depreciation.

For the dwelling cost inflation rate, estimate the real rate of change in housing costs, net of overall price inflation.

Annual Transition Data Worksheet #5:
Interest Rate and Replacement Rate
(decimal numbers)

Interest Rate _____

Replacement Rate _____

Dw Inflation Rate _____

4.2.6 Volume and allocation of formal housing finance. Enter the total volume of formal finance occurring independently of policy interventions, and the distribution of this financing among households by income, tenure, and dwelling status. The allocation matrix entered here should reflect your best estimates of what types of households actually receive formal housing loans. For example, loans may be limited to the top two or three income groups, to secure owners, and to fully adequate dwellings.

The data pre-processor for the Housing Quality Model -- discussed in the next chapter -- can help you construct an allocation scheme from your base year household classification matrix. Specifically, you can indicate the share of formal financing to be allocated to each income group, and identify the tenure/dwelling status categories that receive financing. Using this information, the pre-processor will generate an allocation matrix. If you plan to take advantage of this process, enter the share of formal financing going to each income group, and enter the number 1 in the space for each tenure/dwelling status category that receives any financing.

Annual Transition Data Worksheet #6:
Volume and Allocation of Formal Housing Finance

Volume (in currency units) _____

Allocation
(percentages)

Share allocated to decile 1: _____
Allocation among decile 1 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 2: _____
Allocation among decile 2 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 3: _____
Allocation among decile 3 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 4: _____
Allocation among decile 4 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 5: _____
Allocation among decile 5 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 6: _____
Allocation among decile 6 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 7: _____
Allocation among decile 7 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 8: _____
Allocation among decile 8 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 9: _____
Allocation among decile 9 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 10: _____
Allocation among decile 10 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

4.3 Policy Data Requirements

The Housing Quality Model simulates any number of policies in any given year. The user provides data on the terms and the allocation of each policy, and each policy must be one of four broad types: 1) expansion of formal housing finance; 2) upgrading infrastructure services; 3) regularization of tenure; and 4) sites and services or direct construction. For each type of policy, the same information is required on the allocation of assistance, but the data required to describe the terms of the assistance vary by policy type. This section provides worksheets for preparing one year's terms for a policy of each type, as well as a worksheet for preparing allocation data for any policy.

4.3.1 Terms for expanded formal finance. For each pool of funds available for housing finance, specify the lending terms that will apply. Definitions of these items are provided below.

Formal Finance Policy Terms Worksheet

Aggregate volume of loans, currency units: _____
Interest rate, decimal number: _____
Market interest rate, decimal number: _____
Repayment period years: _____
Expected average loan amount, currency units: _____
Savings/informal mobilization rate, decimal number: _____
Target dwelling status: _____
Minimum cost of target dwelling, currency units: _____
Maximum loan amount, currency units: _____
Maximum loan-to-value ratio, decimal number: _____

Definitions

Aggregate volume of loans, currency units: the total volume of funds available for lending.

Interest rate, decimal number: the annual interest rate participants will be charged on their loans.

Market interest rate, decimal number: the annual interest rate typically charged for comparable loans, or an estimate of the economic cost of funds to the lender. This item is used to determine how much the program costs in terms of interest subsidies.

Repayment period, years: the number of years over which the loans will be repaid.

Expected average loan amount, currency units: on average, approximately how much is each participating household expected to borrow?

Savings/informal mobilization rate, decimal number: the fraction of annual income that households with the opportunity to participate in this policy are expected to mobilize from savings and informal financing sources. For example, if households are expected to be able to mobilize the equivalent of about 3 months income for housing investment, enter 0.25.

Target dwelling status: the integer code that identifies the worst dwelling status that participating households will achieve through this program.

CODES
1: permanent structure, adequate infrastructure
2: permanent structure, inadequate infrastructure
3: semi-permanent structure, adequate infrastructure
4: semi-permanent structure, inadequate infrastructure
5: improvised structure, adequate infrastructure
6: improvised structure, inadequate infrastructure

Minimum cost of target dwelling, currency units: the entry cost of dwellings in the target status category.

Maximum loan amount, currency units: maximum loan that will be granted under this program.

Maximum loan-to-value ratio, decimal number: maximum leveraging that will be allowed under this program.

4.3.2 Terms for infrastructure upgrading. For each infrastructure upgrading program, specify the terms that apply.

Infrastructure Policy Terms Worksheet

Number of participating households, actual number: _____
Household contribution, in currency units: _____
Grant, currency units: _____
Cost of structural upgrade, currency units: _____
Share of households upgrading structures in subsequent years (decimal numbers):
Year 1 _____
Year 2 _____
Year 3 _____
Year 4 _____
Year 5 _____
Savings/Informal mobilization rate, decimal: _____

If the infrastructure upgrading program is accompanied by an earmarked pool of loan funds:

Aggregate volume of loans, currency units: _____
Interest rate, decimal number: _____
Market interest rate, decimal number: _____
Repayment period, years: _____
Expected average loan amount, currency units: _____
Maximum loan amount, currency units: _____
Maximum loan-to-value ratio, decimal number: _____

Definitions

Number of participating households, actual number.

Household contribution, in currency units: the capital contribution a household must make in order to participate in the program. Note that a household may borrow a portion of its contribution.

Grant, currency units: the government's capital contribution for each household participating in the program.

Cost of structural upgrade, currency units: for participants whose current dwellings are semi-permanent, the cost of upgrading to permanent materials.

Share of households upgrading structures in subsequent years (decimal numbers): from the pool of participants whose dwellings are semi-permanent and who cannot afford the full cost of upgrading to permanent materials in the current year, what share will achieve upgrades in subsequent years.

Savings/Informal mobilization rate, decimal: the fraction of annual income that households with the opportunity to participate in this policy are expected to mobilize from savings and informal financing sources. For example, if households are expected to be able to mobilize the equivalent of about 3 months income for housing investment, enter 0.25.

Earmarked loan terms:

Aggregate volume of loans,currency units: the total volume of funds available for lending.

Interest rate, decimal number: the annual interest rate participants will be charged on their loans.

Market interest rate, decimal number: the annual interest rate typically charged for comparable loans, or an estimate of the economic cost of funds to the lender. This item is used to determine how much the program costs in terms of interest subsidies.

Repayment period: the number of years over which the loans will be repaid.

Expected average loan amount, currency units: on average, approximately how much is each participating household expected to borrow?

Maximum loan amount, currency units: maximum loan that will be granted under this program.

Maximum loan-to-value ratio, decimal number: maximum leveraging that will be allowed under this program.

4.3.3 Terms for tenure regularization. For each program for regularizing household tenure, enter the terms that apply.

Tenure Policy Terms Worksheet

Number of participating households, actual number: _____
Household contribution, in currency units: _____
Grant, currency units: _____
Cost of structural upgrade, currency units: _____
Share of households upgrading structures in subsequent years (decimal numbers):
Year 1 _____
Year 2 _____
Year 3 _____
Year 4 _____
Year 5 _____
Savings/Informal mobilization rate, decimal: _____

If the infrastructure upgrading program is accompanied by an earmarked pool of loan funds:

Aggregate volume of loans, currency units: _____
Interest rate, decimal number: _____
Market interest rate, decimal number: _____
Repayment period, years: _____
Expected average loan amount, currency units: _____
Maximum loan amount, currency units: _____
Maximum loan-to-value ratio, decimal number: _____

Definitions

Number of participating households, actual number.

Household contribution, in currency units: the capital contribution a household must make in order to participate in the program. Note that a household may borrow a portion of its contribution.

Grant, currency units: the government's capital contribution for each household participating in the program.

Cost of structural upgrade, currency units: for participants whose current dwellings are semi-permanent, the cost of upgrading to permanent materials.

Share of households upgrading structures in subsequent years (decimal numbers): from the pool of participants whose dwellings are semi-permanent and who cannot afford the full cost of upgrading to permanent materials in the current year, what share will achieve upgrades in subsequent years.

Savings/Informal mobilization rate, decimal: the fraction of annual income that households with the opportunity to participate in this policy are expected to mobilize from savings and informal financing sources. For example, if households are expected to be able to mobilize the equivalent of about 3 months income for housing investment, enter 0.25.

Earmarked loan terms:

Aggregate volume of loans,currency units: the total volume of funds available for lending.

Interest rate, decimal number: the annual interest rate participants will be charged on their loans.

Market interest rate, decimal number: the annual interest rate typically charged for comparable loans, or an estimate of the economic cost of funds to the lender. This item is used to determine how much the program costs in terms of interest subsidies.

Repayment period: the number of years over which the loans will be repaid.

Expected average loan amount, currency units: on average, approximately how much is each participating household expected to borrow?

Maximum loan amount, currency units: maximum loan that will be granted under this program.

Maximum loan-to-value ratio, decimal number: maximum leveraging that will be allowed under this program.

4.3.4 Terms for sites and services or direct construction. For each sites and services or direct construction program, enter the terms that apply.

Sites and Services Policy Terms Worksheet

Number of participating households, actual number: _____
Household contribution, in currency units: _____
Grant, currency units: _____
Target dwelling status: _____
Target tenure status: _____
Cost of structural upgrade, currency units: _____
Share of households upgrading structures in subsequent years (decimal numbers):
Year 1 _____
Year 2 _____
Year 3 _____
Year 4 _____
Year 5 _____
Savings/Informal mobilization rate, decimal: _____

If the program to regularize tenure is accompanied by an earmarked pool of loan funds:

Aggregate volume of loans, currency units: _____
Interest rate, decimal number: _____
Market interest rate, decimal number: _____
Repayment period, years: _____
Expected average loan amount, currency units: _____
Maximum loan amount, currency units: _____
Maximum loan-to-value ratio, decimal number: _____

Definitions

Number of participating households, actual number.

Household contribution, in currency units: the capital contribution a household must make in order to participate in the program. Note that a household may borrow a portion of its share.

Grant, currency units: the government's capital contribution for each household participating in the program.

Target dwelling status: the integer code that identifies the lowest dwelling status that participating households will achieve through this program.

CODES
1: permanent structure, adequate infrastructure
2: permanent structure, inadequate infrastructure
3: semi-permanent structure, adequate infrastructure
4: semi-permanent structure, inadequate infrastructure
5: improvised structure, adequate infrastructure
6: improvised structure, inadequate infrastructure

Target tenure status: the integer code that identifies the tenure that househodls will achieve through this program.

CODES
1: secure owner
2: squatter
3: unit renter
4: room renter

Cost of structural upgrade, currency units: for programs that produce cord units or serviced sites, the cost of upgrading to permanent materials.

Share of households upgrading structures in subsequent years (decimal numbers): from the pool of participants whose dwellings are semi-permanent and who cannot afford the full cost of upgrading to permanent materials in the current year, what share will achieve upgrades in subsequent years.

Savings/Informal mobilization rate, decimal: the fraction of annual income that households with the opportunity to participate in this policy are expected to mobilize from savings and informal financing sources. For example, if households are expected to be able to mobilize the equivalent of about 3 months income for housing investment, enter 0.25.

Earmarked loan terms:

Aggregate volume of loans,currency units: the total volume of funds available for lending.

Interest rate, decimal number: the annual interest rate participants will be charged on their loans.

Market interest rate, decimal number: the annual interest rate typically charged for comparable loans, or an estimate of the economic cost of funds to the lender. This item is used to determine how much the program costs in terms of interest subsidies.

Repayment period: the number of years over which the loans will be repaid.

Expected average loan amount, currency units: on average, approximately how much is each participating household expected to borrow?

Maximum loan amount, currency units: maximum loan that will be granted under this program.

Maximum loan-to-value ratio, decimal number: maximum leveraging that will be allowed under this program.

4.3.5 Allocation data for policy simulations. For each policy to be implemented in a given year, the user must specify ont only the policy terms (defined in the previous four sub-sections), but also the distribution of participation among households by income, tenure, and dwelling status. In other words, what share of the units of assistance will go to each cell in the household classification matrix. The allocation matrix entered here should reflect your best estimates of what types of households will actually participate in a program. Thus, it should reflect affordability considerations, targetting objectives, and the possibility that some assistance will "leak" to households not in the target group.

The data pre-processor for the Housing Quality Model -- discussed in the next chapter -- can help you construct an allocation scheme from your base year household classification matrix. Specifically, you can indicate the share of policy benefits to be allocated to each decile, and identify the tenure/dwelling status categories that receive benefits. Using this information, the pre-processor will generate an allocation matrix. If you plan to take advantage of this process, enter the share of benefits going to each decile, and enter the number 1 in the space for each tenure/dwelling status category that receives any benefits.

Policy Allocation Worksheet
(percentages)

Share allocated to decile 1: _____
Allocation among decile 1 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 2: _____
Allocation among decile 2 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 3: _____
Allocation among decile 3 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 4: _____
Allocation among decile 4 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 5: _____
Allocation among decile 5 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 6: _____
Allocation among decile 6 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 7: _____
Allocation among decile 7 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 8: _____
Allocation among decile 8 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 9: _____
Allocation among decile 9 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

Share allocated to decile 10: _____
Allocation among decile 10 households:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Imp-Pass	Imp-Fail
Secure Owners:	_____	_____	_____	_____	_____	_____
Squatters:	_____	_____	_____	_____	_____	_____
Unit Renters:	_____	_____	_____	_____	_____	_____
Room Renters:	_____	_____	_____	_____	_____	_____

5. RUNNING THE HOUSING QUALITY MODEL: A STEP-BY-STEP GUIDE

This chapter provides step-by-step instructions for running the Housing Quality Model on an IBM PC or PC compatible micro-computer. Before you start, there are several critical prerequisites:

Hardware: You need an IBM PC or PC compatible micro-computer with at least 256K internal memory. Your PC can be configured with one floppy disk drive, two floppy disk drives, or a floppy disk and a hard disk.

Software: You need the standard PC operating system -- PC DOS or MS DOS in version 2.0 or higher. In addition, you need two Housing Quality diskettes: 1) HQM Disk 1 -- Command Files; and 2) HQM Disk 2 -- Data Files.

Knowledge: You need a basic understanding of your PC and the DOS operating system. If you do not know how to turn on your PC, access files from the disk drives, format new diskettes, and rename and copy files; then you will need assistance before you can use this section of the manual.

The remainder of this chapter consists of three sections. First, we explain how to create and modify HQM data files from the worksheets presented in chapter 4. Second, we explain how to run the model once you have created the necessary data sets. Note that the diskette labled "HQM Disk 2" contains the data files you need to follow the instructions for running the Model, even before you create data files of your own. Finally, we present some suggestions on the management of data files developed for Model simulations, since you are likely to create several hundred for a full set of comparative policy scenarios.

Throughout this chapter, we assume that your PC has two floppy disk drives. Instructions for using PCs with only a single floppy disk drive as well as PCs with one floppy disk drive and a hard disk drive are provided in Annex A.

5.1 Creating and Modifying Data Sets for the Housing Quality Mod

Before you can run the Housing Quality Model, you must create th following data files:

a base input data file;

an annual transitions data file for every year;

a policy terms file and a policy allocation file for every policy in every year;

a simulation control file for every year in the simulation period;

The Housing Quality Model is accompanied by a pre-processing package that helps you create and modify these data sets. This package prompts you to enter or modify the information from the various input data worksheets provided in chapter 4, creating the files expected by the Housing Quality Model.

Insert the disk labeled HQM DISK 1 -- COMMAND FILES into the A drive of your PC, and insert a disk for data files into the B drive. Invoke the preprocessor by typing

HQSDATA

The preprocessor's main menu will now appear on your screen:

HOUSING QUALITY SIMULATION MODEL
DATA ENTRY AND PREPROCESSOR PROGRAM

Please select one of the following:

1) Edit Base Input Data File
2) Edit Annual Transitions Data File
3) Edit Formal Finance Policy Terms File
4) Edit Infrastructure Policy Terms File
5) Edit Sites and Services Policy Terms File
6) Edit Tenure Policy Terms File
7) Edit Policy Allocation File
8) Edit Simulation Control File
9) Change default input file drive from B:

0) Exit preprocessor program

Please enter your choice:

The first seven options offered by this menu correspond to the categories of input data discussed in chapter 4 of this manual. Option #8 helps you set up a file of control commands that tells the Housing Quality Model which data files to use for a particular simulation year, and which output tables to produce. Finally option #9 enables you to indicate that data files are

stored somewhere other than on the disk in your PC's B: drive. See Annex D for instructions on running both the pre-processor and the Housing Quality Model on a single disk-drive system or on a system with a hard disk.

You can invoke the options from the pre-processor's main menu in any order, and you can go back and modify files once you have created them. To invoke any option, enter its number and hit [RETURN]. We now review each of the main menu options in turn.

5.1.1 Main Menu Option 1: Edit Base Input Data File. When you invoke this option, the computer will respond with the prompt:

Enter name of base input data file to be edited:

Type the name of the file containing base input data for your simulation, or enter a new name you want to use to identify the base input data file you are creating. For example, let us create a new base input data file called INBASE.186. Since no file of this name exists on the disk in the B: drive, the program will respond:

File B:INBASE.186 cannot be found.
Do you want to create a new file? (y/n)

When you respond to this prompt by entering Y, a file will be created with all variables initialized to zero values. Next, a new menu will appear, offering options that correspond to the the Housing Quality Model's base input data requirements:

Components of file INBASE.186:

1) Income by decile
2) Share of income available for housing
3) Number of households by decile
4) Distribution of households by decile, tenure, dwelling
5) Savings/Informal financing mobilization rate
6) Entry costs at beginning of simulation

Enter choice of component to modify or "0" to exit:

You can select these components in any order, by entering the desired number and hitting [RETURN]. Even if you are creating a new file, from the program's point of view, you are "modifying" components of the file, because all components of a new file are initialized to zero values.

5.1.1(a) Base input option 1: Income by decile. When you select this component, the following dsplay will appear:

```
-------  Income (in currency units)  --------

Before revision:

Decile  1:        0.000
Decile  2:        0.000
Decile  3:        0.000
Decile  4:        0.000
Decile  5:        0.000
Decile  6:        0.000
Decile  7:        0.000
Decile  8:        0.000
Decile  9:        0.000
Decile 10:        0.000

Do you want to change these values?
```

If you respond by entering Y, the display will read:

```
Enter new values or press [RETURN] to keep old value
Decile 1:
```

At this point you type in the mean income for decile 1 from base input worksheet #1, and hit [RETURN]. The computer will then prompt you for decile 2, and so on until you have entered values for all ten deciles. If, for any decile, you hit [RETURN] without entering a number, the original value (0.000 in this case) will be retained. After you have entered all ten income values, they will be displayed, as above, and you will again be asked:

```
Are new values correct (y/n)?
```

You can correct any or all values by responding with N, or you can return to the base input file menu by entering Y.

5.1.1(b) Base input option 2: Share of income available for housing. When you select this component, the following display will appear:

```
-------  Share of income for housing (decimal)  --------

Before revision:

Decile  1:        0.000
Decile  2:        0.000
Decile  3:        0.000
Decile  4:        0.000
Decile  5:        0.000
Decile  6:        0.000
Decile  7:        0.000
Decile  8:        0.000
Decile  9:        0.000
Decile 10:        0.000

Do you want to change these values (y/n)?
```

If you respond by entering Y, the display will read:

```
Enter new values or press [RETURN] to keep old value
Decile 1:
```

At this point you type in the share of income available for housing investment for decile 1 from base input worksheet #2, and hit [RETURN]. The computer will then prompt you for decile 2, and so on until you have entered values for all ten deciles. If, for any decile, you hit [RETURN] without entering a number, the 0.000 value will be retained. After you have entered all ten income values, they will be displayed, as above, and you will again be asked:

```
Are new values correct (y/n)?
```

You can correct any or all values by responding with N, or you can return to the base input file menu by entering Y.

5.1.1(c) Base input option 3: Number of households by decile. When you select this component, the computer will respond:

Do you want to assign a common value to all deciles?

If each of your income deciles (base input worksheet #3) has the same number of households, then answer Y, and the computer will ask:

What value?

At this point, enter the number of households in each decile, and the computer will display the following:

------- Number of households --------

Before revision:

Decile 1:	14778.000
Decile 2:	14778.000
Decile 3:	14778.000
Decile 4:	14778.000
Decile 5:	14778.000
Decile 6:	14778.000
Decile 7:	14778.000
Decile 8:	14778.000
Decile 9:	14778.000
Decile 10:	14778.000

Do you want to change these values (y/n)?

You now have the opportunity to change any or all of these values. If you had not asked to assign a common number of households to all deciles, the display above would have appeared with zero values, allowing you to enter separate values for each decile.

5.1.1(d) Base input option 4: Distribution of households by decile, tenure, dwelling status. When you select this component, the program enables you to enter the distribution of households by tenure and dwelling status for each decile, as in base year data input worksheet #4. First, the following prompt will appear:

Choose number of decile to be edited,
Press [RETURN] to edit decile 1
or enter 0 to end editing.

You can enter data for deciles in any order by entering the number of the decile you want to work with, or you can hit [RETURN] to get the first (lowest) decile. Once you have selected a decile, the following display will appear:

Decile 1 before revisions:

Initial distribution of households (as % of decile)

	Perm-pass	Perm-fail	Semi-pass	Semi-fail	Impr-pass	Impr-fail
Owners	0.000	0.000	0.000	0.000	0.000	0.000
Squatters	0.000	0.000	0.000	0.000	0.000	0.000
Renters	0.000	0.000	0.000	0.000	0.000	0.000
Room Renters	0.000	0.000	0.000	0.000	0.000	0.000

Do you want to modify data for this decile? (y/n)

When you respond to this prompt with a Y, the display will read:

	Perm-pass	Perm-fail	Semi-pass	Semi-fail	Impr-pass	Impr-fail
Owners:						

Now you enter the values from base input data worksheet #4, hitting [RETURN] after each entry. Any time you hit [RETURN] without first entering a value, the original zero value will be retained and displayed. When you finish entering the six values on the line for secure owners, you will be prompted to enter values for squatters, and so on, until you have entered all 24 values for decile 1 (which should sum to 100 percent). Now all the values you have entered will be displayed, and you will again have an opportunity to change any or all of them. When you are satisfied with your entries for this decile, respond with Y to the prompt

Are new values correct (y/n)?

The following prompt will appear:

Choose number of decile to be edited,
Press [RETURN] to edit decile 2
or enter 0 to end editing.

This allows you to start entering data for the next decile. This process continues until you have entered data for all ten deciles, at which point you would enter 0 in response to the prompt above to return to the base input data menu. At this point, the pre-processor will check to determine whether the cells in your household classification matrix sum to 100 percent for each income decile. If the cells do not sum to 100 percent for one or more deciles, you will receive a warning message, identifying the problem deciles, and giving you the option of either continuing to edit the classification matrix or returning to the base input data menu.

5.1.1(e) Base input option 5: Savings/Informal financing mobilization rate. When you select this component, the computer will respond with:

Current value for Savings/Informal Finance Mobilization Rate is:0.000
Enter new value, (as decimal) or press [RETURN] to keep old value:

At this point, you can enter the mobilization rate from base input data worksheet #6. You will then be returned to the base input data menu.

5.1.1(f) Base input option 6: Entry costs at beginning of simulation. When you select this component, the following display will appear on the screen:

------- Entry Costs (in currency units) --------

Before revision:

Perm-Pass:	**0.000**
Perm-Fail:	**0.000**
Semi-Pass:	**0.000**
Semi-Fail:	**0.000**
Impr-Pass:	**0.000**
Impr-Fail:	**0.000**

Do you want to change these values (y/n)?

As usual, a response of Y to this prompt will produce the following:

Enter new values or press [RETURN] to keep old value
Perm-Pass

Once you have entered values for all six dwelling status categories (from base input worksheet #5), these values will be displayed, and you will have another opportunity to modify any or all of them.

5.1.1(g) Base Input Option 0: Save File and/or Exit. When you have finished editing all six components of your base input data file, enter **0** to return to the main menu. This will produce the prompt:

Do you want to save current version? (y/n)

You must answer with a **Y** in order to save all the data entry work you have done. If you answer with a **N**, your work will not be saved on the data disk. When you answer **Y**, the following prompt will appear: **Enter file name of output file, or press [RETURN]** to keep INBASE: This is your opportunity to change the name you gave to the file at the beginning of the session, or, if you have been modifying an existing file, to save the new version in a file of a different name. After you enter a name (or press [RETURN] to keep the original name), you will be prompted for a file extension:

Enter extension of file INBASE:

You must enter the file extension you want to use for this base input data file; hitting [RETURN] at this point will not keep the extension you originally specified. Next, the following prompts will appear on the screen:

New file has been successfully stored as INBASE.186
Do you want to create another clone from this version? (y/n)

This prompt gives you an opportunity to create another file exactly like the one you have just entered, giving it another name. You might want to use this option if you are running two simulations which have similar but not identical base year inputs. In any case, if you answer **Y**, you will be returned to the base input menu so that you can change any components of the file and/or save a new version under a different file name. If you answer **N**, you will be returned to the main pre-processor menu.

5.1.2 Main menu option 2: Edit Annual Transitions Data File.
When you select this option from the pre-processor's main menu, you will be prompted for a file name:

Enter name of Annual Transitions Data File to be edited:

Type the name of your annual transitions data file, or a new name for a transitions file you are creating. For example, let us create a new annual transitions file called INYR.187. Since no file of this name exists on the disk in the B drive, the computer will respond:

File B:INYR.187 cannot be found.
Do you want to create a new file? (y/n)

When you respond to this prompt by entering Y, a file will be created, with all variables initialized to zero values. Next, a new menu will appear, offering options that correspond to the various components of the Housing Quality Model's data requirements for an annual transitions file:

Components of file INYR.187:

1) Income Growth by Decile
2) Interest Rate
3) Number of New Households by Decile
4) Tenure Distribution of New Households
5) Existing Dwelling Transition Rates
6) Replacement Rate
7) Dwelling Inflation Rate
8) Volume of Formal Financing
9) Natural Allocation of Formal Financing

Enter choice of component to modify of "0" to exit

You can select these components in any order, by entering the desired number and hitting [RETURN].

5.1.2(a) Annual transitions option 1: Income Growth by Decile. When you select this component, the computer will respond:

Do you want to assign a common value to all deciles?

If each of your income deciles (annual transitions worksheet #1) has the same rate of income growth, then answer **Y**, and the computer will ask:

What value?

At this point, enter the expected annual rate of income growth, and the computer will display the following:

------- Income Growth Each Decile (as decimal) --------

Before revision:

Decile 1:	**-0.005**
Decile 2:	**-0.005**
Decile 3:	**-0.005**
Decile 4:	**-0.005**
Decile 5:	**-0.005**
Decile 6:	**-0.005**
Decile 7:	**-0.005**
Decile 8:	**-0.005**
Decile 9:	**-0.005**
Decile 10:	**-0.005**

Do you want to change these values?

You now have the opportunity to change any or all of these values. If you had not asked to assign a common number of households to all deciles, the display above would have appeared with zero values, allowing you to enter separate values for each decile.

5.1.2(b) Annual transitions option 2: Interest Rate. When you select this option, the following prompt will appear:

Current Interest Rate is:0.000
Enter new value, (as decimal) or press [RETURN] to keep old value:

When you enter the appropriate value (from annual transitions worksheet #5), you will be returned to the annual transitions menu.

5.1.2(c) Annual transitions option 3: Number of New Households by Decile. When you select this component, the computer will respond:

Do you want to assign a common value to all deciles?

If each of your income deciles (annual transitions worksheet #2) has the same number of net newcomers, then answer Y, and the computer will ask:

What value?

At this point, enter the expected number of net newcomers to each decile, and the computer will display the following:

------- Number of New Households per Decile -------

Before revision:

Decile 1:	6713.000
Decile 2:	6713.000
Decile 3:	6713.000
Decile 4:	6713.000
Decile 5:	6713.000
Decile 6:	6713.000
Decile 7:	6713.000
Decile 8:	6713.000
Decile 9:	6713.000
Decile 10:	6713.000

Do you want to change these values?

You now have the opportunity to change any or all of these values. If you had not asked to assign a common number of households to all deciles, the display above would have appeared with zero values, allowing you to enter separate values for each decile.

5.1.2(d) Annual transitions option 4: Tenure Distribution of New Households. When you select this component of the annual transitions data file, the following display will appear:

Before revisions:

Tenure Distribution of New Households (as decimal)

	Sec-Own	Squatter	Unit-Rent	Room-Rent
Decile 1:	0.000	0.000	0.000	0.000
Decile 2:	0.000	0.000	0.000	0.000
Decile 3:	0.000	0.000	0.000	0.000
Decile 4:	0.000	0.000	0.000	0.000
Decile 5:	0.000	0.000	0.000	0.000
Decile 6:	0.000	0.000	0.000	0.000
Decile 7:	0.000	0.000	0.000	0.000
Decile 8:	0.000	0.000	0.000	0.000
Decile 9:	0.000	0.000	0.000	0.000
Decile 10:	0.000	0.000	0.000	0.000

Do you want to modify data?

When you respond to this prompt with a Y, the display will read:

	Sec-Own	Squatter	Unit-Rent	Room-Rent
Decile 1:				

Now you enter each percentage from annual transitions worksheet #3, hitting [RETURN] after each entry. Any time you hit [RETURN] without first entering a value, the original zero value will be retained and displayed. When you finish entering the four values on the line for decile 1, you will be prompted to enter values for decile 2, and so on, until you have entered all 40 values in the table. Now all the values you have entered will be displayed, and you will again have an opportunity to change any or all of them. When you are satisfied with your entries, respond with Y to the prompt

Are new values correct (y/n)?

5.1.2(e) Annual transitions option 5: Existing Dwelling Transition Rates. When you select this component, the following display will appear:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Impr-Pass	Impr-Fail
Perm-Pass:	0.000	0.000	0.000	0.000	0.000	0.000
Perm-Fail:	0.000	0.000	0.000	0.000	0.000	0.000
Semi-Pass:	0.000	0.000	0.000	0.000	0.000	0.000
Semi-Fail:	0.000	0.000	0.000	0.000	0.000	0.000
Impr-Pass:	0.000	0.000	0.000	0.000	0.000	0.000
Impr-Fail:	0.000	0.000	0.000	0.000	0.000	0.000

Do you want to modify data?

When you respond to this prompt with a Y, the display will read:

	Perm-Pass	Perm-Fail	Semi-Pass	Semi-Fail	Impr-Pass	Impr-Fail
Perm-Pass:						

Now you enter each percentage from annual transitions worksheet #4, hitting [RETURN] after each entry. Any time you hit [RETURN] without first entering a value, the original zero value will be retained and displayed. When you finish entering the six values on the first line, you will be prompted to enter values for the next line, and so on, until you have entered all 36 values in the table. Now all the values you have entered will be displayed, and you will again have an opportunity to change any or all of them. When you are satisfied with your entries, respond with Y to the prompt

Are new values correct (y/n)?

This will return you to the annual transitions menu.

5.1.2(f) Annual transitions option 6: Replacement Rate. When you select this option, the following prompt will appear:

Current Replacement Rate is:0.000
Enter new value, (as decimal) or press [RETURN] to keep old value:

When you enter the appropriate value (from annual transitions worksheet #5), you will be returned to the annual transitions menu.

5.1.2(g) Annual transitions option 7: Dwelling Cost Inflation Rate. When you select this option, the following prompt will appear:

Current Dwelling Cost Inflation Rate is:0.000
Enter new value, (as decimal) or press [RETURN] to keep old value:

When you enter the appropriate value (from annual transitions worksheet #5), you will be returned to the annual transitions menu.

5.1.2(h) Annual transitions option 8: Volume of Formal Financing. When you select this option, the following prompt will appear:

Current Volume of Formal Financing is:0.000
Enter new value, (in currency units) or press [RETURN] to keep old value:

When you enter the appropriate value (from annual transitions worksheet #6), you will be returned to the annual transitions menu.

5.1.2(i) Annual transitions option 9: Natural Allocation of Formal Financing. When you select this option, the following prompt will appear:

Do you want to use the Allocation File Generating Procedure?

The allocation file generating procedure will use the household classification matrix from any base input file you specify to determine the allocation of formal financing among households. If your plan for allocating formal financing (annual transitions worksheet #6) identifies the types of households that will receive financing, and assumes that the amount allocated to a particular cell is proportionate to the number of households in that cell, then you want to use the automatic allocation file generating procedure. To invoke this procedure, answer **Y** to the above prompt, and the following display will appear:

Allocation File Generating Procedure
Enter name of Base Year Input File to use as reference:

Give the full name (including extension) of the base input file that contains the household classification matrix you want to use. Next, you will be prompted:

Do you want to distribute allocation evenly across all deciles?

A response of **Y** to this prompt will allocate 10 percent of formal financing to each income decile. A response of **N** will produce the following:

Please enter fraction of allocation for each decile
or press [RETURN] to enter zeroes
Responses must sum to 1.0

Decile 1:

Enter the share of formal finance going to decile 1, or hit return to keep the original 0.0 value. Next, you will be prompted for decile 2, and so on, until you have entered shares for all ten deciles. If the shares you have entered do not sum to 1.0, a warning message will appear:

Warning: Items should sum to 1.0 but instead they sum to 1.20
Please check your entries.
Press [ESC] to ignore warning, or [RETURN] to continue editing

Since it is essential that the overall allocation of financing sums to 100 percent, press return in response to this prompt, and you will have an opportunity to change any or all of the decile values. Next, you will be prompted to indicate which tenure groups receive formal finance:

Enter "1" if tenure group will receive allocation;
Enter "0" or [RETURN] otherwise.

Secure owners:

If secure owners receive formal financing, enter 1, otherwise, enter 0. Next you will be prompted to indicate whether squatters, room renters, and finally, unit renters receive formal financing. After you have completed the four tenure classes, you will be prompted to indicate which dwelling status categories receive formal financ:

Enter "1" if dwelling group will receive allocation;
Enter "0" or [RETURN] otherwise.

Perm-pass:

If occupants of fully acceptable dwellings receive formal financing, enter 1, otherwise, enter 0. Next you will be prompted to indicated whether each of the other dwelling status categories receive formal financing. After you have completed all six dwelling status categories the following prompt will appear:

Print new allocations? (y/n)

A response of Y will cause the complete allocation matrix to print out on your printer (not on the screen). The pre-processor has calculated the share of formal financing going to each cell in the classification matrix, based on the information you have provided and on distribution of households in the base year

household classification matrix. Now you are given an opportunity to modify the allocation matrix:

Choose number of decile to be edited,
Press [RETURN] to edit decile 1,

or enter 0 to end editing

5.1.2(j) Annual Transitions Option 0: Save File and/or Exit. When you have finished editing all nine components of your annual transitions data file, enter 0 to return to the main menu. This will produce the prompt:

Do you want to save current version? (y/n)

You must answer with a Y in order to save all the data entry work you have done. If you answer with a N, your work will not be saved on the data disk. When you answer Y, the following prompt will appear:

Enter file name of output file, or press [RETURN] to keep INYR:

This is your opportunity to change the name you gave to the file at the beginning of the session, or, if you have been modifying an existing file, to save the new version in a file of a different name. After you enter a name (or press [RETURN] to keep the original name), you will be prompted for a file extension:

Enter extension of file INYR:

You must enter the file extension you want to use for this annual transitions data file; hitting [RETURN] at this point will not keep the extension you originally specified. Next, the following prompts will appear on the screen:

New file has been successfully stored as INYR.186
Do you want to create another clone from this version? (y/n)

This prompt gives you an opportunity to create another file exactly like the one you have just entered, giving it another name. You might want to use this option if you are running a simulation in which many transition rates are constant from one year to the next. In any case, if you answer Y, you will be returned to the annual transitions data menu so that you can change any components of the file and/or save a new version under a different file name. If you answer N, you will be returned to the main pre-processor menu.

5.1.3 Main Menu Option 3: Edit Formal Finance Policy Terms File

When you select this option from the pre-processor's main menu, you will be prompted for a file name:

Enter name of Formal Finance Policy Terms File to be edited:

Type the name of your policy allocation file, or a new name for the policy terms file you are creating. For example, let us create a new policy terms file called FRMA.187. Since no file of this name exists on the disk in the B: drive, the computer will respond:

File B:FRMA.187 cannot be found.
Do you want to create a new file? (y/n)

When you respond to this prompt by entering Y, a file will be created, with all variables initialized to zero values. Next, the following prompt will appear:

---------Formal Finance Policy Terms File----------

Before revision:

Aggregate volume (in currency units)	:	0.000
Interest rate (as decimal)	:	0.000
Market interest rate (as decimal)	:	0.000
Repayment period	:	0.000
Expected Average Loan	:	0.000
Savings/Informal Mobilization (decimal)	:	0.000
Target Dwelling Status (as integer 1-6)	:	0.000
Minimum Cost of Target Dwelling	:	0.000
Maximum Loan (in currency units)	:	0.000
Maximum Loan to Value Ratio (decimal)	:	0.000

Do you want to change these values? (y/n)

When you respond with a Y, you will be prompted for each entry in turn. Simply type the appropriate values from the expanded formal finance policy worksheet, and hit [RETURN] to go on to the next entry. When you have completed the list of policy terms, the new values will be displayed again, as above, and you will have another opportunity to change any or all values. Finally, when you indicate that all values are correct, the following prompt will appear:

Do you want to save current version? (y/n)

You must answer Y in order to save the data you have just entered. New files are stored under the name you selected when you first created the policy terms file, and you have an opportunity to create similar or identical files under separate names.

5.1.4 Main menu option 4: Edit Infrastructure Policy Terms File. When you select this option from the pre-processor's main menu, you will be prompted for a file name:

Enter name of Infrastructure Policy Terms File to be edited:

Type the name of your policy allocation file, or a new name for the policy terms file you are creating. For example, let us create a new policy terms file called INFA.187. Since no file of this name exists on the disk in the B: drive, the computer will respond:

File B:INFA.187 cannot be found.
Do you want to create a new file? (y/n)

When you respond to this prompt by entering Y, a file will be created, with all variables initialized to zero values. Next, the following prompt will appear:

---------Infrastructure Policy Terms File----------

Before revision:

Number of Households		:	0.000
Household contribution (currency units)		:	0.000
Grant (in currency units):		:	0.000
Cost of Structural Upgrade		:	0.000
Subsequent yr upgrade rates:	Year 1	:	0.000
	Year 2	:	0.000
	Year 3	:	0.000
	Year 4	:	0.000
	Year 5	:	0.000
Savings/Informal Mobilization Rate		:	0.000
Earmarked Loan: Aggregate volume		:	0.000
Interest rate		:	0.000
Market interest rate		:	0.000
Loan term		:	0.000
Estimated Average Loan		:	0.000
Maximum Loan		:	0.000
Maximum Loan/Value		:	0.000

Do you want to change these values? (y/n)

When you respond with a Y, you will be prompted for each entry in turn. Simply type the appropriate values from the infrastructure policy worksheet, and hit [RETURN] to go on to the next entry. When you have completed the list of policy terms, the new values will be displayed again, as above, and you will have another opportunity to change any or all values. Finally, when you indicate that all values are correct, the following prompt will appear:

Do you want to save current version? (y/n)

You must answer Y in order to save the data you have just entered. New files are stored under the name you selected when you first created the policy terms file, and you have an opportunity to create similar or identical files under separate names.

5.1.5 Main menu option 5: Edit Sites and Services Policy Terms File

When you select this option from the pre-processor's main menu, you will be prompted for a file name:

Enter name of Sites & Services Policy Terms File to be edited:

Type the name of your policy allocation file, or a new name for the policy terms file you are creating. For example, let us create a new policy terms file called SITA.187. Since no file of this name exists on the disk in the B: drive, the computer will respond:

File B:SITA.187 cannot be found.
Do you want to create a new file? (y/n)

When you respond to this prompt by entering Y, a file will be created, with all variables initialized to zero values. Next, the following prompt will appear:

---------Sites & Services Policy Terms File----------

Before revision:

Number of Households		:	0.000
Household contribution (currency units)		:	0.000
Grant (in currency units):		:	0.000
Target Dwelling Status (integer 1-6)		:	0.000
Target Tenure Status (integer 1-4)		:	0.000
Cost of Structural Upgrade		:	0.000
Subsequent yr upgrade rates:	Year 1	:	0.000
	Year 2	:	0.000
	Year 3	:	0.000
	Year 4	:	0.000
	Year 5	:	0.000
Savings/Informal Mobilization Rate		:	0.000
Earmarked Loan: Aggregate volume		:	0.000
Interest rate		:	0.000
Market interest rate		:	0.000
Loan term		:	0.000
Estimated Average Loan		:	0.000
Maximum Loan		:	0.000
Maximum Loan/Value		:	0.000

Do you want to change these values? (y/n)

When you respond with a Y, you will be prompted for each entry in turn. Simply type the appropriate values from the sites and services policy worksheet, and hit [RETURN] to go on to the next entry. When you have completed the list of policy terms, the new values will be displayed again, as above, and you will have another opportunity to change any or all values. Finally, when you indicate that all values are correct, the following prompt will appear:

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Do you want to save current version? (y/n)

You must answer Y in order to save the data you have just entered. New files are stored under the name you selected when you first created the policy terms file, and you have an opportunity to create similar or identical files under separate names.

5.1.6 Main Menu option 6: Tenure Policy Terms File.
When you select this option from the pre-processor's main menu, you will be prompted for a file name:

Enter name of Tenure Policy Terms File to be edited:

Type the name of your policy allocation file, or a new name for the policy terms file you are creating. For example, let us create a new policy terms file called TENA.187. Since no file of this name exists on the disk in the B: drive, the computer will respond:

File B:TENA.187 cannot be found.
Do you want to create a new file? (y/n)

When you respond to this prompt by entering Y, a file will be created, with all variables initialized to zero values. Next, the following prompt will appear:

---------Tenure Policy Terms File----------

Before revision:

Number of Households		:	0.000
Household contribution (currency units)		:	0.000
Grant (in currency units):		:	0.000
Cost of Structural Upgrade		:	0.000
Subsequent yr upgrade rates:	Year 1	:	0.000
	Year 2	:	0.000
	Year 3	:	0.000
	Year 4	:	0.000
	Year 5	:	0.000
Savings/Informal Mobilization Rate		:	0.000
Earmarked Loan: Aggregate volume		:	0.000
Interest rate		:	0.000
Market interest rate		:	0.000
Loan term		:	0.000
Estimated Average Loan		:	0.000
Maximum Loan		:	0.000
Maximum Loan/Value		:	0.000

Do you want to change these values? (y/n)

When you respond with a Y, you will be prompted for each entry in turn. Simply type the appropriate values from the tenure policy worksheet, and hit [RETURN] to go on to the next entry. When you have completed the list of policy terms, the new values will be displayed again, as above, and you will have another opportunity to change any or all values. Finally, when you indicate that all values are correct, the following prompt will appear:

Do you want to save current version? (y/n)

You must answer Y in order to save the data you have just entered. New files are stored under the name you selected when you first created the policy terms file, and you have an opportunity to create similar or identical files under separate names.

5.1.7 Main menu option 7: Edit policy allocation File.
When you select this option from the pre-processor's main menu, you will be prompted for a file name:

Enter name of Policy Allocation File to be edited:

Type the name of your policy allocation file, or a new name for an allocation file you are creating. For example, let us create a new allocation file called ALPOL.100. Since no file of this name exists on the disk in the B: drive, the computer will respond:

File B:ALPOL.100 cannot be found.
Do you want to create a new file? (y/n)

When you respond to this prompt by entering Y, a file will be created, with all variables initialized to zero values. Next, the following prompt will appear:

Do you want to use the Allocation File Generating Procedure?

The allocation file generating procedure will use the household classification matrix from any base input file you specify to determine the allocation of a policy among households. If your plan for allocating the current policy (policy allocation worksheet) identifies the types of households that will receive financing, and assumes that the amount allocated to a particular cell is proportionate to the number of households in that cell, then you want to use the automatic allocation file generating procedure. To invoke this procedure, answer Y to the above prompt, and the following display will appear:

Allocation File Generating Procedure
Enter name of Base Year Input File to use as reference:

Give the full name (including extension) of the base input file that contains the household classification matrix you want to use. Next, you will be prompted:

Do you want to distribute allocation evenly across all deciles?

A response of Y to this prompt will allocate 10 percent of the assistance available under your policy to each income decile. A response of N will produce the following:

Please enter fraction of allocation for each decile
or press [RETURN] to enter zeroes
Responses must sum to 1.0

Decile 1:

Enter the share of assistance going to decile 1, or hit return to keep the original 0.0 value. Next, you will be prompted for decile 2, and so on, until you have entered shares for all ten deciles. If the shares you have entered do not sum to 1.0, a warning message will appear:

Warning: Items should sum to 1.0 but instead they sum to 1.20
Please check your entries.
Press [ESC] to ignore warning, or [RETURN] to continue editing

Since it is essential that the overall allocation of assistance sums to 100 percent, press return in response to this prompt, and you will have an opportunity to change any or all of the decile values. Next, you will be prompted to indicate which tenure groups will receive assistance:

Enter "1" if tenure group will receive allocation;
Enter "0" or [RETURN] otherwise.

Secure owners:

If secure owners receive assistance, enter 1, otherwise, enter 0. Next you will be prompted to indicate whether squatters, room renters, and finally, unit renters receive assistance. After you have completed the four tenure classes, you will be prompted to indicate which dwelling status categories receive assistance:

Enter "1" if dwelling group will receive allocation;
Enter "0" or [RETURN] otherwise.

Perm-pass:

If occupants of fully acceptable dwellings receive assistance, enter 1, otherwise, enter 0. Next you will be prompted to indicated whether each of the other dwelling status categories receive assistance. After you have completed all six dwelling status categories the following prompt will appear:

Print new allocations? (y/n)

A response of Y will cause the complete allocation matrix to print out on your printer (not on the screen). The pre-processor has calculated the share of assistance going to each cell in the classification matrix, based on the information you have provided and on distribution of households in the base year household classification matrix. Now you are given an opportunity to modify the allocation matrix:

Choose number of decile to be edited,
Press [RETURN] to edit decile 1,

or enter 0 to end editing

5.1.8 Main menu option 8: Edit Simulation Control File.
Because the Housing Quality Model requires so many input data files for each simulation year, the pre-processor helps you set up a "simulation control file" which identifies the annual transition data file and any policy data files that the model should use for a particular simulation year. In addition, the simulation control file allows you to indicate which of the model's many annual output tables you want displayed in any given simulation year.

When you select this option from the pre-processor's main menu, you will be prompted for a file name:

Enter name of Simulation Control File to be edited:

Type the name of your annual simulation control file, or a new name for a control file you are creating. The Housing Quality Model expects control files to have file names that are only two characters long, and to have file types (file extensions) that correspond to the last two digits of the year to which they apply. For example, let us create a new simulation control file for metro Honduras, policy scenario A in 1986. It woul make sense to call this file MA.86. Since no file of this name exists on the disk in the B: drive, the computer will respond:

File B:MA.86 cannot be found.
Do you want to create a new file? (y/n)

When you respond to this prompt by entering Y, a file will be created, with all variables initialized to zero or null values. Next, a new menu will appear, offering options that correspond to the various components of the Housing Quality Model's data requirements for a simulation control file:

Components of file B:MA.86:

1) Specification of Tables to Print
2) Name of Yearly Transition File
3) Input File Names (up to 20)

Enter choice of component to modify or "0" to exit

You can select these components in any order, by entering the desired number and hitting [RETURN]. Note that, from the program's point of view, you are "modifying" components of the file, even if it is a new file, because all components are initialized to zero or null values when the file is created.

5.1.8(a) Simulation control option #1: Specification of Tables to Print. When you select this option, the following display will appear on your monitor, listing all of the tables that the Housing Quality Model can generate on an annual basis (see chapter 3 for a description of the contents of these tables):

------Enter 0 to Skip, 1 to Review, and 2 to Print------

Before revision:

All End of Simulation Reports	**:**	**0.000**
Scheduled Upgrades	**:**	**0.000**
Impacts of Each Formal Finance Policy	**:**	**0.000**
Impacts of Each Infrastructure Policy	**:**	**0.000**
Impacts of Each Sites & Services Policy	**:**	**0.000**
Impacts of Each Tenure Policy	**:**	**0.000**
Impact of All Policies Combined	**:**	**0.000**
Total Resource Requirements	**:**	**0.000**
Savings/Informal Finance with Title	**:**	**0.000**
Savings/Informal Finance without Title	**:**	**0.000**
Net New Dwelling Units Constructed	**:**	**0.000**
Dwelling Units Vacant	**:**	**0.000**
Room Renters by Dwelling Status	**:**	**0.000**
Room Renters by Income Class	**:**	**0.000**
Households by Income and Tenure	**:**	**0.000**
Households by Income and Dwelling	**:**	**0.000**

Do you want to change these values? (y/n)

When you enter Y, the system will respond with:
All End of Simulation Reports :

Now enter 1 if you want to review all the tables for the current simulation year on your monitor as the simulation progresses. Reviewing tables gives you the option of printing each one after you have seen it. Enter 2 if you want all the tables for the current simulation year printed as the simulation progresses. Hit [RETURN] to retain the 0 value if you do not want to review or print all of the tables. Now the program will proceed down the list of individual output tables, giving you the opportunity to select each one for review or printing. When you have made a selection for each table on the list, all of your choices will be displayed and you will have another opportunity to modify any or all of them before returning to the simulation control menu.

5.1.8(b) Simulation control option 2: Name of yearly transition file. This option prompts you to enter the name of the file containing the annual transition data for the current simulation year (see section 5.1.2 for instructions on setting up annual transitions data files). If this is a new simulation control file that you are creating, the prompt will be

Present Transition File Name is: .
Do you want to change?

If you answer with a Y, you will be prompted for the name of the file:

Please enter the transition file name

If you plan to have all of your data files on a disk in your computer's B: drive when you run the Housing Quality Model, you should be sure to include the B: indicator in the name of the annual transitions file. For example, you might enter **B:MYR.106.**

5.1.8(c) Simulation control option 3: Input file names. When you select this option, the following prompt will appear:

Before Revisions
Policies for simulation control file: MA.86

Type	Title	Terms	Allocation

Do you want to change this list? (y/n)

This option enables you to list the policies in effect for the current simulation year, to identify the type and title for each, and to indicate where the applicable terms files and allocation files are stored. When you respond to the above prompt with a Y, the following display will appear:

	Type	Title	Terms	Allocation
Policy 1:				

Now enter the integer code identifying the first policy's type:

1 Expanded Formal Finance
2 Infrastructure Upgrading
3 Regularized Tenure
4 Sites & Services or Direct Construction

Next, enter a title (up to 10 characters) that will distinguish this policy. Then enter the name of the file containing the policy terms (see sections 5.1.3 through 5.1.6), and finally, enter the name of the file containing the policy allocation (see section 5.1.7). Both file names should include the B: if you expect to have the data files on a disk in your computer's B: drive. Keep entering the information for the policies you want to simulate in the current year, until they have all been entered. Then enter 0 in response to the prompt for policy type, and the list will be completed. At this point, all of your entries will be displayed again, and you will have another opportunity to change or delete any or all of them before returning to the simulation control menu.

5.1.8(d) Simulation Control Option 0: Save File and/or Quit. When you have finished creating a simulation control file, enter 0 in response to the simulation control menu, and the following prompt will appear:

Do you want to save current version? (y/n)

You must answer with a Y in order to save all the data entry work you have done. If you answer with a N, your simulation control file will not be saved on the data disk. When you answer Y, the following prompt will appear:

Enter file name of output file, or press [RETURN] to keep MA:

This is your opportunity to change the name you gave to the file at the beginning of the session, or, if you have been modifying an existing file, to save the new version in a file of a different name. After you enter a name (or press [RETURN] to keep the original name), you will be prompted for a file extension:

Enter extension of file MA:

You must enter the file extension you want to use for this simulation control file; hitting [RETURN] at this point will not keep the extension you originally specified. Next, the following prompts will appear on the screen:

New file has been successfully stored as B:MA.86
Do you want to create another clone from this version? (y/n)

This prompt gives you an opportunity to create another file like the one you have just entered, giving it another name. You will probably want to use this option to create simulation control files for multiple years in which the same or similar policies are in effect. If you answer Y, you will be returned to the simulation control menu so that you can change any components of the file and/or save a new version under a different file name. If you answer N, you will be returned to the main pre-processor menu.

5.2 Running the Housing Quality Model

As noted earlier, before you can run the Housing Quality Model, you must create the following data files:

a base input data file;

an annual transitions data file for every year in the simulation period;

a policy terms file and a policy allocation file for every policy that is to be simulated in any given year;

a simulation control file for every year in the simulation period, referencing the annual transitions data file for the current year and any policy files applicable in the current year.

The previous section of this chapter (section 5.1) explains how to generate these data files. This section provides instructions on running the Model, and uses the following files for illustration:

INBASE.186: base input data file for the metropolitan sector of Honduras, 1986.

INYR.186, INYR.187, INYR.188, INYR.189, INYR.190: annual transitions data files for the metropolitan sector of Honduras, 1986-1990.

FRMA.186, FRMA.187, FRMA.188, FRMA.189, FRMA.190: policy terms files for a home improvement lending program for the metropolitan sector of Honduras, 1986-1990.

ALFRMA.100: policy allocation file for the home improvement lending program for the metropolitan sector of Honduras.

M0.86, M0.87, M0.88, M0.89, M0.90: simulation control files for a policy scenario encompassing a home improvement lending program and a new construction program for the metropolitan sector of Honduras, 1986-1990.

These files are provided for illustrative purposes on the disk labeled HQM DISK 2 -- DATA FILES.

Insert the DATA FILES disk into the B: drive of your PC, and insert the disk labeled HQM DISK 1 -- COMMAND FILES into the A: drive. Now type the command:

NEWHQM

The computer will respond with the prompt:

Please enter a title for this simulation.

The title you enter (up to 20 characters) will have no impact on

the operation of the Model, but it will appear at the top of all printed output. After you enter an appropriate title, the computer will return the prompt:

Please enter the name of your base input data file:

Since the data files for this illustrative simulation are on the disk in the B: drive, we enter

B:INBASE.186

The Model indicates that it has read in all of the base input data by displaying:

Original entry costs successfully input

Next it prompts you for the initial year of your simulation period:

Please enter beginning year of simulation
For example, if simulation begins in 1986, enter 1986

Since 1986 is in fact the base year for our simulation period, we enter

1986

Now the Model requests the total number of years in the simulation period:

Please enter number of years for this simulation:
Integer value greater than 0

We enter the integer value 5, since our simulation period extends five years, from 1986 to 1990. The next display prompts you for the file name of your simulation control files, each of which -- as discussed in section 5.1.8 -- must have file extensions corresponding to the last two digits of the simulation year to which it applies:

Please enter two letters denoting series of input file lists to use as inputs for automatic file management. For example to use files A1.83, A1.84, A1.85, etc., answer: A1

For this illustrative simulation, the simulation control files are named M0, and they are on the disk in the B: drive. Therefore, we enter:

B:M0

From now on, the Model proceeds without any help from you. However, as it completes each year's simulation, it will display tables on the screen and on your printer. Exactly what appears on the screen and on your printer depends on what tables are selected for review or for printing in your simulation control

files. Any table that you selected for review will be displayed on the PC monitor, and you will have an opportunity to indicate whether or not you want it printed. Tables that you selected for printing will automatically be printed at the same time they are displayed on your monitor.

5.3 Suggestions for File Management

Full implementations of the Housing Quality Model typically involve several alternative policy scenarios -- each involving multiple programs -- simulated for three sectors, over a multi-year simulation period. Thus, the data files for a full implementation can easily number in the hundreds. We recommend the following file naming and disk management conventions to help keep track of all these files:

Maintain a separate data diskette for each region.

Use the first digit of each file name extension to designate the sector. For example, all files containing data for the metro sector could have extensions beginnng with the number 1, while files containing data for the urban and rural sectors have extensions beginning with 2 and 3, respectively.

Use the remaining two digits of each file extension to indicate the year to which the file applies. Files that apply to multiple years can have 00 as the last two digits in the file extension.

Files containing base input data should all have INBASE as the file name. Thus, the 1986 base input data for the metro sector would have a file name and extension of INBASE.186.

Files containing annual transitions data should all have the file name of INYR. Thus, the annual transitions files for the metro sector in 1987 through 1990 would be named: INYR.187, INYR.188, INYR.189, and INYR.190.

All files containing terms for expanded formal finance policies should have names that contain the letters FRM, combined with letters or numbers keyed to specific policies. Thus, the file containing the terms for formal finance policy "A" for the metro sector in 1988 would be called FRMA.188.

All files containing terms for infrastructure upgrading policies should have names that the letters INF, combined with letters or numbers keyed to specific policies.

All files containing terms for tenure regularization policies should have names that the letters TEN, combined with letters or numbers keyed to specific policies.

All files containing terms for sites and services policies should have names that the letters SIT, combined with letters or numbers keyed to specific policies.

All files containing allocation data for policies should have names beginning with the letters AL, combined with the letters indicating policy type (FRM, INF, TEN, SIT) and the letters or numbers identifying the specific policy.

All simulation control files must have two letter names and two digit extensions. The two letters in the name must be the same for all simulation control files in the same sequence, and the two digits in the file extension must correspond to the simulation year.

6. UNDERSTANDING THE COMPUTER PROGRAM

This chapter provides a brief overview of the computer programs that implement the Housing Quality Model and the accompanying data pre-processor. Most users will not need to refer to this material, but some may be interested in reviewing portions of the program to understand in greater detail how the Model works. Other users may actually want to modify the program, or add specialized policy modules. The computer program itself has been carefully structured and commented to make it understandable, and -- with the information provided in this chapter -- users who are familiar with higher level programming languages should have no difficulty finding the portions of the code that they want to review or modify.

The Housing Quality Model is written in the PASCAL computer programming language. It was developed using the TURBO PASCAL system as implemented for MS-DOS operating systems. The latest version of the Model uses version 4.0 of the TURBO Pascal system.[1] TURBO PASCAL (distributed by Borland International, Inc.) provides an environment for editing, compiling, and running PASCAL programs; and any users who intend to modify or add to the Housing Quality Model should acquire their own versions of TURBO PASCAL.

The diskette labeled HQM DISK 3 -- SOURCE FILES, contains all of the PASCAL routines invoked both by the Housing Quality Model itself and by the data pre-processor. Both programs consist of several files, and each file contains a PASCAL unit, which consists of one or more PASCAL procedures or code segments. Exhibit 6.1 describes all of the procedures in the Housing Quality Model program, and indicates which file each procedure is stored in. Exhibit 6.2 does the same for all the procedures in the pre-processor program. Finally, Exhibit 6.3 defines all of the major variables used in the HQSMODEL program, indicating where they are declared, and what their dimensions are.

1. The data preprocessor for the Housing Quality Model has not been updated to version 4.0. It is still programmed in version 3.0 of TURBO PASCAL.

EXHIBIT 6.1:
HOUSING QUALITY MODEL PROCEDURE DEFINITIONS

PROCEDURE NAME	FILE NAME	DESCRIPTION
NEWHQM	NEWHQM.PAS	Main control routine. Uses global variable declaration file (GLOBAL); performs initialization and set-up, calls solution routine for each year in simulation period; calls final output routine.
BASEIN	SETUP.PAS	Called from NEWHQM. Reads in base-year data. Creates household classification matrix.
SOLVEYR	SOLVE.PAS	Called from NEWHQM. Control routine for annual solution. Initializes; calls routines for annual inputs, background transitions, policies, annual outputs.
SUMMARY	WRAPUP.PAS	Called from NEWHQM. Generates summary tables on cumulative results for full simulation period.
BASEIN	WRAPUP.PAS	Called from NEWHQM. Generates base input file from results of current simulation.
YEARIN	SOLVE.PAS	Called from SOLVEYR. Reads in annual background transitions data.
YEARNATRL	YEARGUTS.PAS	Called from SOLVEYR. Simulates background transitions.
YEARGOVT	YEARGUTS.PAS	Called from SOLVEYR. Simulates policy transitions.
YEARVAC	YEARGUTS.PAS	Called from SOLVEYR. Updates information on cumulative vacancies, allowing some units to deteriorate and ultimately drop out of the stock.
YEAROUT	YEARTABS.PAS	Called from SOLVEYR. Generates output tables from annual solutions.
AFFORD	YEARGUTS.PAS	Called from YEARNATRL. Calculates maximum dwelling value affordable for each income class, and generates entry costs for each dwelling status.
NETNEW	YEARGUTS.PAS	Called from YEARNATRL. Adds net new households to the household classification matrix, calculating dwelling unit and resource implications.
REPLACE	YEARGUTS.PAS	Called from YEARNATRL. Calculates dwelling units and resources needed to replace occupied units that drop out of the stock.
TRANSTN	YEARGUTS.PAS	Called from YEARNATRL. Performs transitions of existing dwelling units from one status to another.
RESOURCE	YEARGUTS.PAS	Called from YEARNATRL. Calculates cumulative results of NETNEW, REPLACE, and TRANSTN.
EXPFORMAL	POLICYA.PAS	Called from YEARGOVT. Calculates impacts of an expanded formal finance policy.

PROCEDURE NAME	FILE NAME	DESCRIPTION
INFRA-STRUCT	POLICYA.PAS	Called from YEARGOVT. Calculates impacts of a policy to extend adequate infrastructure to existing settlements.
SITESSRV	POLICYB.PAS	Called from YEARGOVT. Calculates impacts of a sites and services or direct construction policy.
REGTEN	POLICYB.PAS	Called from YEARGOVT. Calculates impacts of a policy to regularize tenure in squatter settlements.
SUMPOL	YEARGUTS.PAS	Called from YEARGOVT. Calculates cumulative impacts of all policies in effect for the year, and produces summary output tables.
INFORMAL	POLICYA.PAS	Called from EXPFORM. Reads input data for an expanded formal finance policy.
DEPLOY-FORM	POLICYA.PAS	Called from EXPFORM. Controls the allocation of expanded formal finance.
ININFRA	POLICYA.PAS	Called from INFRASTRUCT. Reads input data for an infrastructure policy.
DEPLOY-INFRA	POLICYA.PAS	Called from INFRASTRUCT. Controls the allocation of infrastructure.
INSITES	POLICYB.PAS	Called from SITESSRV. Reads input data for a sites and services or direct construction policy.
DEPLOY-SITES	POLICYB.PAS	Called from SITESSRV. Controls the allocation of sites and services or direct construction units.
INTEN	POLICYB.PAS	Called from REGTEN. Reads input data for a policy to regularize tenure.
DEPLOYTEN	POLICYB.PAS	Called from REGTEN. Controls the allocation of a policy to regularize tenure.
AFFORD	POLICYA.PAS POLICYB.PAS	Specialized versions of AFFORD are called from EXPFORMAL, INFRASTRUCT, SITESSRV, and REGTEN. In each case, AFFORD calculates maximum affordable levels of housing investment, given the terms of the policy being simulated.
ALLOCATE	POLICYA.PAS POLICYB.PAS	Specialized versions of ALLOCATE are called from EXPFORMAL, INFRASTRUCT, SITESSRV, and REGTEN. In each case, ALLOCATE distributes opportunities to participate in the policy being simulated across eligible cells in the household classification matrix.

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EXHIBIT 6.2:
DATA PRE-PROCESSOR PROCEDURE DEFINITIONS

PROCEDURE NAME	FILE NAME	DESCRIPTION
HQSDATA	HQSDATA.PAS	Main control routine. Desplays main menu of input options and invokes user's selections.
BASEMOD	HQSDATA.PAS	Called from HQSDATA. Creates or modifies the base year input data file.
TRANSMOD	HQSDATA.PAS	Called from HQSDATA. Creates or modifies the annual transitions data files.
FORMTMOD	HQSDATA.PAS	Called from HQSDATA. Creates or modifies files defining the terms of expanded formal finance policies.
INFTMOD	HQSDATA.PAS	Called from HQSDATA. Creates or modifies files defining the terms of infrastructure policies.
SITESTMOD	HQSDATA.PAS	Called from HQSDATA. Creates or modifies files defining the terms of sites and services or direct construction policies.
REGTMOD	HQSDATA.PAS	Called from HQSDATA. Creates or modifies files defining the terms of policies to regularize tenure.
ALCTMOD	HQSDATA.PAS	Called from HQSDATA. Controls the creation or modification of files defining the allocation of policies among cells in the household classification matrix.
ALLOCATE	HQSDATA.PAS	Called from ALCTMOD. Prompts user for information on desired allocation. Uses base year household matrix to complete allocation.
READBASE	HQSDATA.PAS	Called from ALLOCATE. Reads base year household classification matrix.
The remaining HQSDATA subroutines are general purpose input procedures, invoked by all the major control routines listed above.		
ASKYN	PART1.MOD	Prompts the user for a yes/no answer and checks the response for errors until a valid response is given.
ASKINT	PART1.MOD	Prompts the user for an integer value and checks for a valid response.
READWD	PART1.MOD	Prompts the user for a real number and checks for a valid response.
OPENEXT	PART1.MOD	Requests the name of a file extension, and opens the appropriate input file.
OPENOUT	PART1.MOD	Requests the name of a file extension, and opens the appropriate output file.
RDARRY	PART1.MOD	Reads a three-dimensional array into memory.

PROCEDURE NAME	FILE NAME	DESCRIPTION
WRTARRY	PART1.MOD	Writes a three dimensional array to a specified file.
MODLNR	PART1.MOD	Displays a one dimensional array for on-screen editing.
DECMOD	PART1.MOD	Prompts user for modifications to a two dimensional array.
MODARRAY	PART1.MOD	Prompts user for modifications to a three dimensional array.
INITI	PART1.MOD	Initializes a one dimensional array of integers to zero values.
INITR	PART1.MOD	Initializes a one dimensional array of reals to zero values.
INITV	PART1.MOD	Initializes a three dimensional array to zero values.
TESTSUMR	PART1.MOD	Sums an array of real numbers and returns a flag if the sum is not equal to one.
TESTSUMA	PART1.MOD	Tests a three dimensional array to determine whether components sum correctly.
PRNTTXT	PART1.MOD	Prints a text file.

EXHIBIT 6.3:
HOUSING QUALITY MODEL VARIABLE DEFINITIONS

VARIABLES DECLARED IN	NAME	DIMENSIONS	DEFINITION
NEWHQM	HHCLASS	10 × 4 × 6	Household Classification Matrix
	INCOME		Mean Household Income
	HSNGINV		Share of Inc for Hsng Invstmnt
	COUNT		Number of Households
	YEAR		Annual Segment of HH Record
	NEWUNITS		New Units
	TRANSUNITS		Units Changing Status
	NEWHHINV		Investment for New Units
	TRANSINV		Invst for Units Chngng Status
	TOTINV		Total Investment
	INVESTORS		Total Number of Investors
	FORMAL		Total Formal Finance
	SI		Total Savings/Informal Finance
	SUBSIDY		Total Subsidy
	POLICYHHS		HHs Participating in Policies
	POLICYDWS		DWs Participating in Policies
	HHBASE	10 × 4 × 6	Base Year Allocation of Households
	VACANCIES	6	Cumulative Vacancies
	NEW		Newly Vacant Units
	OLD		Units Vacant Last Year
	DROPPING		Units Vacant Last Two Years
	TOTAL		Total Vacant Units
	UPGRADES	10 × 5	Units Scheduled for Future Upgrade
	HHS		Total Number of Households
	SI		Total Savings/Informal Invstmnt
	STARTENTRY	6	Starting Entry Costs
	SIMOBRAT	--	Base Case Rate of Savings/Informal Mobilization
	DWINFLATE	--	Real Rate of Inflation in DW Costs
SOLVEYR	INCGROWTH	10	Real Rates of Income Growth
	NEWHHS	10 × 4	Net New Households
	DWTRANS	6 × 6	Rates of Transition between Dwelling Status Categories
	SHRFORM	10 × 4 × 6	Distribution of Formal Finance
	NEWUNITS	6	New Dwelling Units Required
	ENTRYCOST	6	Entry Costs
	CAPINC	10	Capitalized Value of Income Available for Housing Investment
	INTRATE	--	Market Interest Rate
	REPRATE	--	Rate at which Dwellings Drop out of the Stock

VARIABLES DECLARED IN	NAME	DIMENSIONS	DEFINITION
SOLVEYR	TOTFF	--	Total Volume of Formal Finance
	TOTSI	--	Total Volume of Savings/Informal Finance
	DROPOUTS	--	Total Units Dropped from Stock
YEAROUT	COUNTINCTEN RAW ROWPCT COLPCT	10 x 4	Count of HHs by Income & Tenure Raw Count Row Percent Column Percent
	COUNTINCDW RAW ROWPCT COLPCT	10 x 6	Count of HHs by Income & Dw Status Raw Count Row Percent Column Percent
	COUNTINC	10	Count of HHs by Income
	COUNTTEN	4	Count of HHs by Tenure
	COUNTDW	6	Count of HHs by Dwelling Status
	CROWDINC RAW PCT	10	Crowded HHs by Income Raw Count Percent
	CROWDDW RAW PCT	7	Crowded HHs by Dw Status (& Total) Raw Count Percent
	TOTNEWDW	7	New Dws by Dw Status (& Total)
	SIMOB	10 x 2 x 6	Savings/Informal Mobilization
	AGGRES SECTOR TOTAL FORMAL SI GOVT OWNERS TOTAL FORMAL SI GOVT LANDLRDS TOTAL FORMAL SI GOVT	--	Aggregate Resource Requirements For the Sector as a Whole Total Resources Required Formal Finance Savings/Informal Investment Government Contribution For Owner Occupants Total Resources Required Formal Finance Savings/Informal Investment Government Contribution For Landlords Total Resources Required Formal Finance Savings/Informal Investment Government Contribution
	TOTCROWD	--	Total Number of Crowded Units

VARIABLES DECLARED IN	NAME	DIMENSIONS	DEFINITION
EXPFORM	POLICY	--	Terms for Formal Finance Policy
	AGGAMT		Aggregate Volume
	INTRATE		Interest Rate
	MKTRATE		Market Interest Rate
	PERIOD		Loan Term
	ESTAVG		Estimated Average Loan Amount
	MAXSIMOB		Max Savings/Inf Mobilization
	REQDWSTAT		Lowest Acceptable Dw Status
	MINDWVAL		Minimum Dwelling Value
	MAXLOAN		Maximum Loan Amount
	MAXLVRAT		Maximum Loan to Value Ratio
	MAXBORROW	10	Maximum Affordable Loan by Inc
	ALLOC	10 × 4 × 6	Allocation of Loan Funds
DEPLOYFORM	LOANVALUES	10 × 4 × 6	Affordable Financing for Policy
	MAXAFFORD		Max Affordable Dwelling Value
	SICONTRIB		Savings/Informal Contribution
	LOANAMT		Formal Loan Amount
AFFORD (from DEPLOYFORM)	MAXBORROW	10	Max Affordable Loan
	ELIG	10 × 4 × 6	Eligibility to Participate in Prog
ALLOCATE (from DEPLOYFORM)	PARTHHS	--	Total Households Participating
	ACTPMT	--	Discounted Value of Actual Interest Payments on Loan
	MKTPMT	--	Discounted Value of Interest Payments at Market Rate
	SUBSIDY	--	Total Government Subsidy

VARIABLES DECLARED IN	NAME	DIMENSIONS	DEFINITION
INFRASTRUCT	POLICY	--	Terms for Infrastructure Policy
	NUMUNITS		Total Volume of Assistance
	REQCONTRIB		Required HH Contribution
	GRANT		Government Gran
	UPGRADECOST		Cost of Upgrading Structure
	UPGRDRATE	5	Rate of Future Structure Upgrds
	MAXSIMOB		Max Savings/Informal Mobilizatn
	LOAN		Terms for Loans
	AGGAMT		Aggregate Volume
	INTRATE		Interest Rate
	MKTRATE		Market Interest Rate
	PERIOD		Loan Term
	ESTAVG		Estimated Average Loan Amount
	MAXLOAN		Maximum Loan Amount
	MAXLVRAT		Maximum Loan to Value Ratio
	ALLOC	10 × 4 × 6	Allocation of Infrastrctr Asstnce
DEPLOYINFRA	INFRAVALUES	10 × 4 × 6	Affordable Financing for Policy
	MAXAFFORD		Max Affordable Dwelling Value
	SICONTRIB		Savings/Informal Contribution
	LOANAMT		Formal Loan Amount
AFFORD from DEPLOYINFRA	MAXBORROW	10	Max Affordable Loan
	ELIG	10 × 4 × 6	Eligibility to Participate in Prog
ALLOCATE from DEPLOYINFRA	PARTHHS	--	Total Households Participating
	ACTPMT	--	Discounted Value of Actual Interest Payments on Loan
	MKTPMT	--	Discounted Value of Interest Payments at Market Rate
	SUBSIDY	--	Total Government Subsidy

VARIABLES DECLARED IN	NAME	DIMENSIONS	DEFINITION
SITESSRV	POLICY	--	Terms for Sites & Services Policy
	NUMUNITS		Total Volume of Assistance
	REQCONTRIB		Required HH Contribution
	GRANT		Government Gran
	TARGDW		Dw Status after Participation
	TARGTEN		Tenure after Participation
	INCINVEST		Cost of Incremental Improvemnts
	UPGRDRATE	5	Rate of Future Structure Upgrds
	MAXSIMOB		Max Savings/Informal Mobilizatn
	LOAN		Terms for Loans
	AGGAMT		Aggregate Volume
	INTRATE		Interest Rate
	MKTRATE		Market Interest Rate
	PERIOD		Loan Term
	ESTAVG		Estimated Average Loan Amount
	MAXLOAN		Maximum Loan Amount
	MAXLVRAT		Maximum Loan to Value Ratio
	ALLOC	10 × 4 × 6	Allocation of Sites & Srvc Asstnce
DEPLOYSITES	SITESVALUES	10 × 4 × 6	Affordable Financing for Policy
	MAXAFFORD		Max Affordable Dwelling Value
	SICONTRIB		Savings/Informal Contribution
	LOANAMT		Formal Loan Amount
AFFORD from DEPLOYSITES	MAXBORROW	10	Max Affordable Loan
	ELIG	10 × 4 × 6	Eligibility to Participate in Prog
ALLOCATE from DEPLOYSITES	PARTHHS	--	Total Households Participating
	ACTPMT	--	Discounted Value of Actual Interest Payments on Loan
	MKTPMT	--	Discounted Value of Interest Payments at Market Rate
	SUBSIDY	--	Total Government Subsidy

ANNEX A: RUNNING THE MODEL WITH A HARD DISK OR ON A PC WITH ONLY ONE DISK DRIVE

Chapter 4, which explains how to run the Housing Quality Model, assumes that you have a PC with two floppy disk drives. In this standard PC environment, you will typically keep the diskette with the program command files in drive A:, while diskettes with data files are inserted into drive B:. The Housing Quality Model also runs effectively on PCs with hard disks, as well as PCs with only one disk drive. This Annex outlines modifications to the step-by-step instructions in Chapter 4 that you should adopt if you have a hard disk or a single-drive PC.

Running the Housing Quality Model with a Hard Disk

If you have a PC with a hard disk, we recommend that you copy all of the files on the diskette labeled HQM DISK #1 -- COMMAND FILES into a directory on your hard disk. For illustrative purposes, assume that you have created a directory on your hard disk called HQM (MD \HQM) and that you have copied the HQM command file diskette into this directory. Now enter this directory (CD \HQM) whenever you want to issue the HQSMODEL or HQSDATA commands, invoking the Housing Quality Model or the data pre-processor.

Now you can insert the diskette labeled HQM DISK #2 -- DATA FILES into your floppy disk drive, and follow all the remaining instructions in Chapter 4 without modification. These instructions assume that data files are stored on the B: drive,

and the first time your PC finds a reference to the B: drive, it will prompt you to

Insert disk into drive B: and hit return

If you hit [RETURN] in response to this prompt, the floppy disk drive will be treated as your B: drive for the remainder of the session, and both the Housing Quality Model and the data pre-processor will read and write data files to it.

Running the Housing Quality Model on a Single-Drive PC

If your PC only has one disk drive, we recommend that you follow the instructions in Chapter 4, keeping data files on separate disks from the HQM command files, and -- in effect -- pretending that the command files are in drive A: and the data files are in drive B:. Your PC will go along with this pretense, prompting you to change the diskette in the single drive. For example, starting with the command file disk in the disk drive, invoke the pre-processor by typing

HQSDATA

Now select main menu option 1 (Edit Base Input Data File), and enter **TEST.BAS** as the name of the file you want to modify. Since the pre-processor assumes that data files are stored on the B: drive, your computer will issue the following prompt:

Insert disk into drive B: and hit return

Put the HQM data disk into the disk drive and hit [RETURN]. Your PC will now treat its single drive as a B: drive rather than an A: drive, and you can follow the remaining pre-processor instructions in Chapter 4 without modification. The same process

will apply when you run the Housing Quality Model; on the first reference to a file on the B: drive, your PC will prompt you to put the B disk in the single drive, and it will then treat this drive as the B: drive.

ANNEX B:
ILLUSTRATIVE MODEL OUTPUT

TOTAL RESOURCE REQUIREMENTS (in millions) -- 1986

For the Sector	275.82
Formal Financing	72.70
Savings/Informal	203.12
Govt. Subsidies	0.00
For Owner-Occupants	207.15
Formal Financing	72.70
Savings/Informal	134.45
Govt. Subsidies	0.00
For Unit Landlords	68.67
Formal Financing	0.00
Savings/Informal	68.67
Govt. Subsidies	0.00

SAVINGS/INFORMAL FINANCING AS % OF INCOME -- 1986
OWNERS WITH CLEAR TITLE

	DWELLING STATUS					
INCOME	perm-pass	perm-fail	semi-pass	semi-fail	imprv-pass	imprv-fail
low 1	1.07	2.44	3.90	0.00	1.66	0.23
2	0.89	1.81	3.48	0.00	0.94	0.12
3	0.83	1.56	87.05	0.00	0.59	0.08
4	0.88	1.66	48.78	0.00	0.46	0.06
5	1.47	2.55	33.29	0.00	0.38	0.05
6	-1.42	2.94	27.68	0.00	0.30	0.04
7	-0.51	3.06	62.85	0.00	0.25	0.03
8	0.24	3.05	53.51	0.00	0.00	0.00
9	0.79	2.98	57.07	0.00	0.00	0.00
high 10	1.47	2.43	0.00	0.00	0.00	0.00

SAVINGS/INFORMAL FINANCING AS % OF INCOME -- 1986
OWNERS WITHOUT CLEAR TITLE

	DWELLING STATUS					
INCOME	perm-pass	perm-fail	semi-pass	semi-fail	imprv-pass	imprv-fail
low 1	1.39	2.44	27.40	0.00	1.66	0.23
2	1.24	1.79	41.28	0.00	0.94	0.12
3	1.72	2.20	55.70	0.00	0.59	0.08
4	1.80	2.23	51.95	0.00	0.46	0.06
5	2.30	2.76	77.54	0.00	0.38	0.05
6	2.35	2.89	186.76	0.00	0.30	0.04
7	2.38	2.99	80.64	0.00	0.25	0.03
8	2.43	3.05	76.59	0.00	0.20	0.03
9	0.00	0.00	0.00	0.00	0.00	0.00
high 10	0.00	0.00	0.00	0.00	0.00	0.00

NET NEW DWELLING UNITS CONSTRUCTED -- 1986

DWELLING STATUS					
perm-pass	perm-fail	semi-pass	semi-fail	imprv-pass	imprv-fail
3439	2117	717	340	75	319

ROOM RENTERS BY DWELLING STATUS -- 1986

	DWELLING STATUS					
	perm-pass	perm-fail	semi-pass	semi-fail	imprv-pass	imprv-fail
number	0	0	0	0	0	0
percent	0.00	0.00	0.00	0.00	0.00	0.00

ROOM RENTERS BY INCOME CLASS -- 1986

	INCOME CLASS									
	low									high
	1	2	3	4	5	6	7	8	9	10
number	0	0	0	0	0	0	0	0	0	0
percent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HOUSEHOLDS BY INCOME AND TENURE -- 1986
(count,row percent,col percent)

INCOME	TENURE secure owners	squatters	unit renters	room renters	total
low 1	4366	3090	7994	0	15449
	28.26	20.00	51.74	0.00	
	7.50	5.71	18.95	0.00	
2	3543	6180	5726	0	15449
	22.93	40.00	37.07	0.00	
	6.08	11.43	13.58	0.00	
3	1444	12359	1646	0	15449
	9.35	80.00	10.65	0.00	
	2.48	22.86	3.90	0.00	
4	1555	12359	1535	0	15449
	10.06	80.00	9.94	0.00	
	2.67	22.86	3.64	0.00	
5	3279	9269	2900	0	15449
	21.23	60.00	18.77	0.00	
	5.63	17.14	6.88	0.00	
6	4936	6180	4333	0	15449
	31.95	40.00	28.05	0.00	
	8.48	11.43	10.27	0.00	
7	7342	3090	5017	0	15449
	47.53	20.00	32.47	0.00	
	12.61	5.71	11.89	0.00	
8	8860	1545	5044	0	15449
	57.35	10.00	32.65	0.00	
	15.21	2.86	11.96	0.00	
9	10087	0	5362	0	15449
	65.30	0.00	34.70	0.00	
	17.32	0.00	12.71	0.00	
high 10	12827	0	2622	0	15449
	83.03	0.00	16.97	0.00	
	22.02	0.00	6.22	0.00	
total	58239	54272	42179	0	

HOUSEHOLDS BY INCOME AND DWELLING STATUS -- 1986
(count,row percent,col percent)

INCOME	DWELLING STATUS perm-pass	perm-fail	semi-pass	semi-fail	imprv-pass	imprv-fail	total
low 1	3255	3806	3241	1815	565	2765	15449
	21.07	24.64	20.98	11.75	3.66	17.90	
	4.44	7.69	20.35	25.67	34.37	39.13	
2	4696	4792	2795	1256	386	1523	15449
	30.40	31.02	18.10	8.13	2.50	9.86	
	6.41	9.68	17.55	17.76	23.47	21.55	
3	5050	5199	2670	1158	286	1086	15449
	32.69	33.65	17.28	7.49	1.85	7.03	
	6.89	10.50	16.76	16.37	17.37	15.37	
4	5486	5793	2316	1031	198	626	15449
	35.51	37.50	14.99	6.67	1.28	4.05	
	7.49	11.70	14.54	14.58	12.02	8.85	
5	7135	5686	1740	706	39	143	15449
	46.19	36.80	11.27	4.57	0.25	0.93	
	9.74	11.48	10.92	9.98	2.35	2.03	
6	7055	5938	1380	436	97	542	15449
	45.66	38.44	8.93	2.83	0.63	3.51	
	9.63	11.99	8.66	6.17	5.92	7.67	
7	7474	6683	729	290	60	213	15449
	48.38	43.26	4.72	1.88	0.39	1.38	
	10.20	13.49	4.58	4.10	3.66	3.02	
8	8770	6052	381	155	14	77	15449
	56.77	39.17	2.47	1.00	0.09	0.50	
	11.97	12.22	2.39	2.19	0.85	1.09	
9	9819	4939	433	166	0	91	15449
	63.56	31.97	2.81	1.08	0.00	0.59	
	13.40	9.97	2.72	2.35	0.00	1.29	
igh 10	14511	636	244	58	0	0	15449
	93.93	4.12	1.58	0.38	0.00	0.00	
	19.81	1.28	1.53	0.83	0.00	0.00	
total	73250	49523	15932	7072	1645	7087	

CHF NEW CONSTRUCTION -- 1986

Income		Households Participating number	Households Participating percent	Households Achieving Acceptable Dws number	Households Achieving Acceptable Dws percent
low	1	6	18.00	6	18.00
	2	6	18.00	6	18.00
	3	6	18.00	6	18.00
	4	6	18.00	6	18.00
	5	6	18.00	6	18.00
	6	3	10.00	3	10.00
	7	0	0.00	0	0.00
	8	0	0.00	0	0.00
	9	0	0.00	0	0.00
high	10	0	0.00	0	0.00
Total		34	100.00	34	100.00

ALL POLICIES COMBINED -- 1986

Income		Households Participating number	Households Participating percent	Households Achieving Acceptable Dws number	Households Achieving Acceptable Dws percent
low	1	68	16.91	29	15.49
	2	70	17.39	32	16.94
	3	71	17.78	34	18.39
	4	74	18.55	36	19.02
	5	75	18.84	34	17.98
	6	42	10.52	23	12.18
	7	0	0.00	0	0.00
	8	0	0.00	0	0.00
	9	0	0.00	0	0.00
high	10	0	0.00	0	0.00
Total		400	100.00	187	100.00

SCHEDULED UPGRADES -- 1986
(Households achieving fully acceptable units due to past program participation)

Income		Number	Percent
low	1	0	0.00
	2	0	0.00
	3	0	0.00
	4	0	0.00
	5	0	0.00
	6	0	0.00
	7	0	0.00
	8	0	0.00
	9	0	0.00
gh	10	0	0.00
total		0	100.00

ANNUAL RESOURCE REQUIREMENTS (in millions)

	Total Sector	Owner-Occupants	Unit Landlords
1986			
Total	275.82	207.15	68.67
Formal Financing	72.70	72.70	0.00
Savings/Informal	203.12	134.45	68.67
Govt. Subsidies	0.00	0.00	0.00
1987			
Total	278.45	210.01	68.45
Formal Financing	75.70	75.70	0.00
Savings/Informal	202.75	134.31	68.45
Govt. Subsidies	0.00	0.00	0.00
1988			
Total	276.28	208.06	68.23
Formal Financing	75.00	75.00	0.00
Savings/Informal	201.28	133.06	68.23
Govt. Subsidies	0.00	0.00	0.00
1989			
Total	279.22	210.27	68.95
Formal Financing	75.00	75.00	0.00
Savings/Informal	204.22	135.27	68.95
Govt. Subsidies	0.00	0.00	0.00
1990			
Total	282.51	211.87	70.64
Formal Financing	72.00	72.00	0.00
Savings/Informal	210.51	139.87	70.64
Govt. Subsidies	0.00	0.00	0.00
986-1990			
Total	1392.28	1047.35	344.93
Formal Financing	370.40	370.40	0.00
Savings/Informal	1021.88	676.95	344.93
Govt. Subsidies	0.00	0.00	0.00

INCREASE IN PERCENT FULLY ADEQUATE UNITS

Decile	1986	1990	GAIN
low 1	19.479	25.775	6.296
2	28.906	34.734	5.828
3	31.199	36.981	5.782
4	34.094	39.524	5.429
5	45.002	49.747	4.744
6	44.669	48.788	4.119
7	47.706	50.811	3.105
8	56.259	58.637	2.379
9	63.096	65.222	2.126
high10	93.805	94.326	0.521
TOTAL	68601	91489	22887
pcnt	0.464	0.505	0.040

MEASURES OF EFFICIENCY FOR 1986-1990

Total Investment	:	1392280178
Increase in Number of Acceptable Units	:	22887
Total Investment per New Acceptable Unit	:	60832
Gov't Subsidy Per New Acceptable Unit	:	0
Total Number of Policy Participants	:	1218
Total Program Expenditure	:	10399998
Total Program Expenditure per Participant	:	8542

Percent Distribution of Investment:

Formal Finance	:	28.80
Government Subsidy	:	0.02