

# **RiskAn**

for Macintosh and Windows

**USER MANUAL**

**and**

**REFERENCE GUIDE**



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# **RiskAn 3.1**

## **for Macintosh and Windows**

A computer based simulation program for determining the worth of an investment based on the probabilities of the cash flows in and out that investment.

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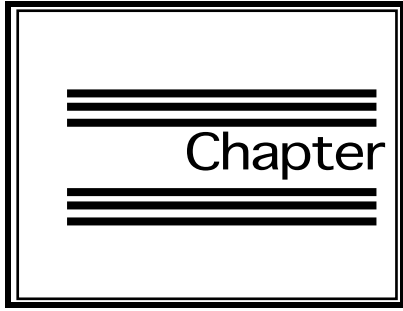
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## **Introduction**

This chapter explains how RiskAn works, the problems it solves, a guide to the typical usage of the program and how to install it.



### 1.1 How RiskAn Works

The analysis of the financial viability of a project involves examination of the future environments in which the proposed investment is set. This will lead to estimates of future cash flows. The dimensions of each of these cash flows are time and amount. The time and the amount of a cash flow can vary. Each variation for a cash flow will impact on the measures of financial worth of the investment. Financial Risk Analysis is aimed at assessing the impact variations in the cash flows will have on the overall project's worth. It is aimed at arriving at measures of probability that certain investment measure will reach a required target figure. It is sophisticated analysis and will find use for those projects about which there is some doubt or worry. It is a tool for use by project initiators and for financiers. The use of this tool will help quantify the financial risk profile for a given set of assumptions about the future. It is a tool which is expected to get increasing use.

The appropriate *measures of investment worth fall into 2 broad groups :-*

Those associated with Cumulative Cash Flow Analysis :-

- ❖ *Margin* (difference between inflows and outflows)
- ❖ *Payback Time* (the time it takes to have all invested monies returned from the investment)

## RiskAn User Guide

❖ *Cash Exposure* (the amount of cash that is invested at any time)

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Those associated with Discounted Cash Flow Analysis  
:-

- ❖ *Net Present Value of the Cash Flows (NPV)* at a specified rate.
- ❖ *NPV Payback Time* (the time it takes to get all NPV invested back)
- ❖ *Internal Rate of Return (IRR)* – the discount rate at which the NPV becomes zero.

The broad sweep of this risk analysis approach is to firstly set up probability models of the investment – (saying what the estimated chances in 10 that a cash flow amount and time has of occurring, and as some cash flows can be related to other cash flows in time and/or amount, or, related internally amount to time, these relationships are to be specified in the probability model). Having got the model set up the second step will be to use Monte Carlo analysis to assess the chances that the measures of worth will reach a certain level. The final step will be to present and interpret the analysis for use in decision making.

This analysis can be done using the *RiskAn* program. This manual and the associated discussion are the instructions for the use of this program.

*RiskAn* is available for PC-compatibles (it is a “Windows” based program) and for Apple Macintosh computers.

### 1.2 Trademarks and Credits

The RiskAn name, manual, suite of applications and courses are copyright of:

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### Manual Editions

Second edition September 1985

Third edition January 1989

Fourth edition April 1991

Fifth edition October 1993

Sixth edition April 1994

Seventh edition February 1996

### Screen Shots

The screen shots in this manual are taken from either the MacOS version or the Windows version of RiskAn. We have tried to keep the functionality identical between the environments and should be easily translated to the other environment if needed.

### Apple PowerBooks

Owners of the Apple PowerBooks should turn OFF the *Processor Cycling* option, especially during analysis as the intensive CPU usage may be confused as inactivity and the analysis slows to a crawl! This problem has been addressed in the later versions of RiskAn.

### 1.3 What You Need

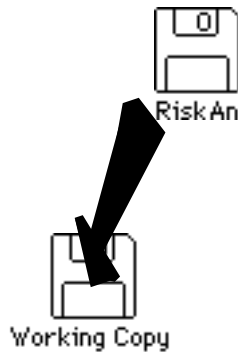
To run the program you will need

- ❖ A PC-compatible 386sx or greater with at least one 3 1/2" floppy drive running DOS 3 or greater, Windows 3.1 or Windows 95.
- ❖ A Macintosh Plus or greater with at least one DSDD floppy drive running System 6, System 7 or later. 750 kilobytes are needed by the application.
- ❖ A working copy of your original RiskAn diskettes.
- ❖ At least one megabyte of free RAM.

### **1.4 Registration Card**

Please take a couple of minutes, before you start, to fill in and return your registration card. Registered users will receive notification of new products, friendly support and discounts on program upgrades. Register now – otherwise we may not know who you are.

### 1.5 Making a Working Copy



#### Windows

Use the Windows File Manager to duplicate the original floppy disks, creating a working copy.

#### MacOS

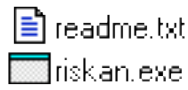
Use the Finder to drag the files (or whole disk) from your original RiskAn disks to blank floppies which you will use as your working copy (or to a convenient folder on your hard disk). Then put your original disks away in a safe place.

If you are unsure how to make a copy of the files on your RiskAn disks, see your Computer's *User Guide*.

RiskAn is NOT copy-protected. You may make backup copies for your own use and may copy the files to a Hard Disk for more convenient execution. RiskAn is subject to copyright protection and you are prohibited by law from making copies of the programs or documentation for any other purpose.



### 1.6 Check the ReadMe File



Insert the RiskAn working copy into the floppy drive and double-click on it to open it. Double-click on the file called

#### *ReadMe*

The screen will clear and the contents of the *ReadMe* file will appear. It contains information that was not available in time for printing in the manual, helpful hints and other useful things. You can browse through the file by using the arrow keys, PgUp, PgDn keys or the scroll bars.

Information in the ReadMe file takes priority over information in this manual.

If you would like a printed copy of the information in the ReadMe file, choose *Print...* from under the File menu. When you have finished, choose *Quit* from under the File menu.

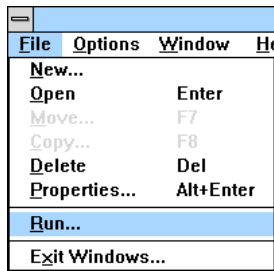
### **1.7 First Time Through**

Nobody likes reading manuals, particularly when they want to try out a new piece of software. This section provides enough information to get started.

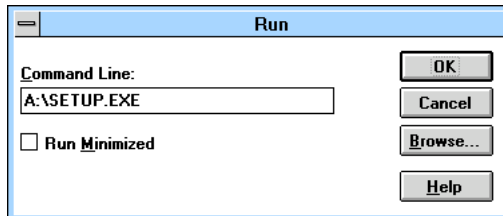
Because RiskAn uses standard menus and windows, learning it is very simple. If you are even moderately familiar with Windows or the Macintosh you will be able to use the program with ease.

However, please don't forget to go back and read the rest of the manual later. It will save you time in the long run. The more technical readers will want to read the advanced sections for further information.

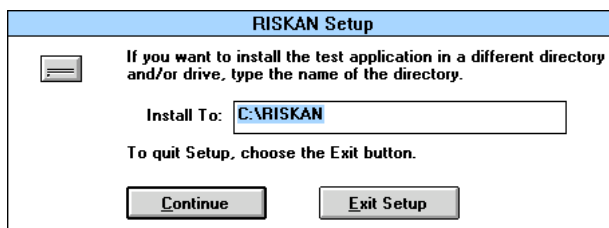
## 1.8 Installing RiskAn for Windows



Insert your working copy of RiskAn into the floppy drive, assumed to be drive A: in the example shown. Choose *Run...* from the *File* menu when in the Program Manager.



You can either enter the value *A:\SETUP.EXE* as shown in the command line field, or click on the *Browse...* button and navigate to the *SETUP.EXE* file on the A: drive. Click on *OK* to begin the installation process.



You will need to indicate where to store the RiskAn application. The default is in a new directory called *RISKAN* on the *C: drive*, but this folder or location can be changed to something more suitable.

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If you choose a location on a file server, RiskAn will need the privilege to be able to create, write and delete files in this directory as part of the running of RiskAn.

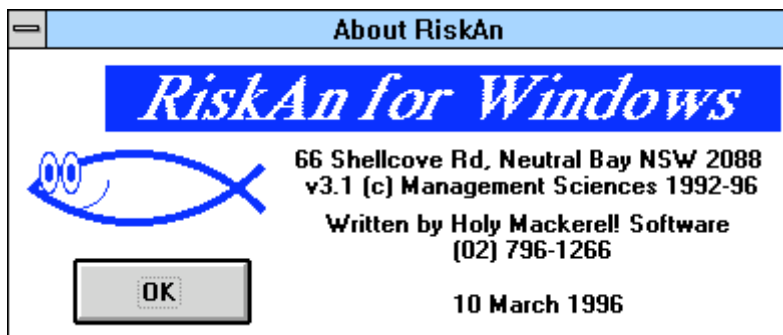


RiskAn will place some files in the Windows *SYSTEM* directory and others in the RISKAN directory. When the installation is complete after a few seconds a dialog button will appear. Click on the *OK* button.



An new group and icon called RiskAn will now appear in your Program Manager. This icon can be moved, renamed or deleted. Remember that deleting the icon in the Program Manager will not remove the underlying application – this must be done in the File Manager.

To launch RiskAn, double-click on the *RiskAn icon*.

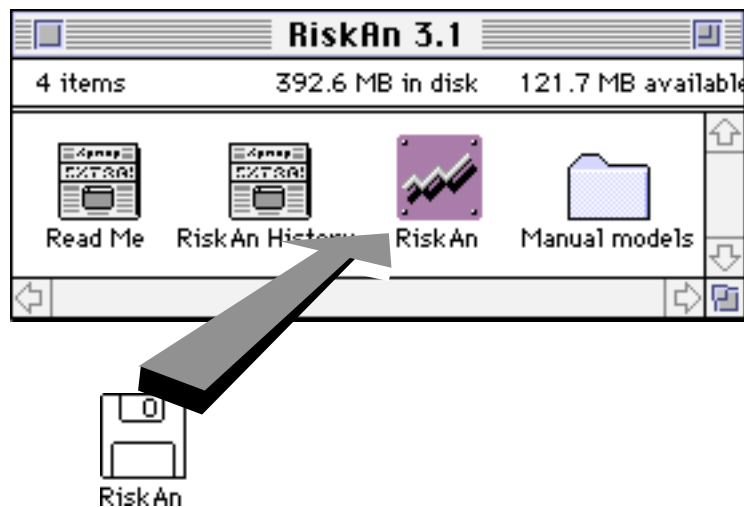


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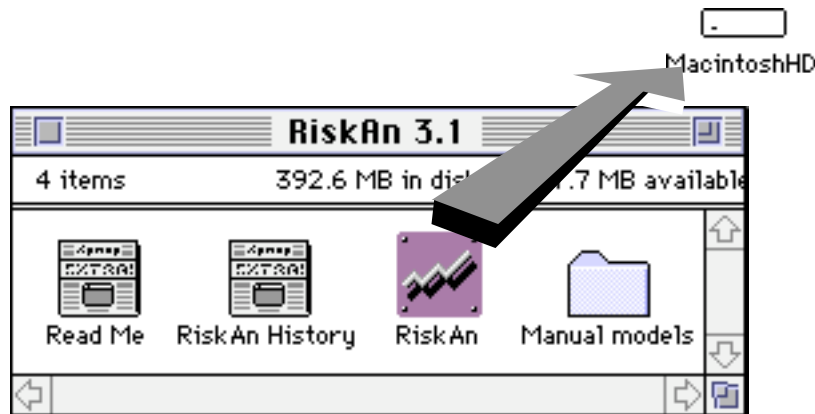
When RiskAn first launches, it displays an initial splash screen giving the date and version of the application.

After this screen, RiskAn shown the entry window for the first cashflow.

## 1.9 Installing RiskAn for Macintosh



After inserting the RiskAn for Macintosh floppy into the floppy drive, double-click on the floppy disk icon on the desktop. The window for the floppy disk should open.



Drag the icon for the RiskAn application onto the hard drive. The application can be run from any location and can be moved at any time. You may copy the other documents from the floppy disk if you desire.

To launch RiskAn, double-click on the *RiskAn icon*.

# RiskAn User Guide



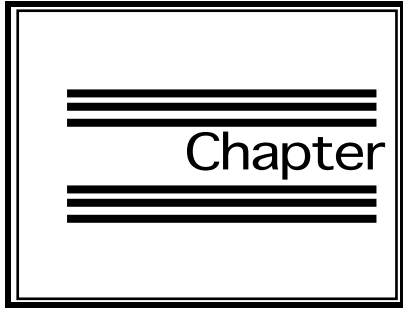
When RiskAn first launches, it displays an initial *splash screen* giving the date and version of the application. After this screen, RiskAn shows the entry window for the first cashflow.

The entry window for the first cashflow is titled "Untitled". It contains a table with columns for "Description", "Amount", "Prob.", "Time", and "Prob.". The first row is highlighted in yellow and contains the value "\$0.00" in the "Amount" column. The "Total" row shows a total of 0. To the right of the table, there is a "Relationship" section with radio buttons for "None(N)", "Amounts(A)", "Times(T)", "Amounts & Times(AT)", "Times to Amounts(H)", and "Amount & Time to Amount(AH)". Below this, there is a "Cashflow" section showing "1 of 1". At the bottom, there are buttons for "Analysis", "Mgn Array", "Reports", "Insert", "Duplicate", "Remove", "Goto", and navigation arrows.

Description	Amount	Prob.	Time	Prob.
	\$0.00	0	0	0
	\$0.00	0	0	0
	\$0.00	0	0	0
	\$0.00	0	0	0
	\$0.00	0	0	0
	\$0.00	0	0	0
	\$0.00	0	0	0
	\$0.00	0	0	0
	\$0.00	0	0	0
	\$0.00	0	0	0
Total	0	0	0	0

# RiskAn User Guide





## **Objectives Of The Analysis**

This chapter looks at what analysis is and how we go about determining the worth of an investment.

## RiskAn User Guide

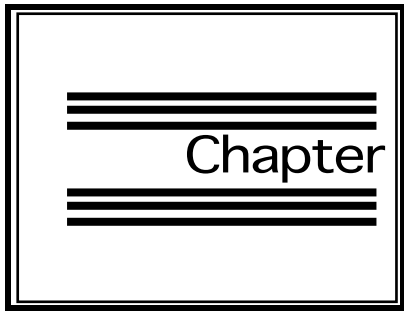
It is usual that those reviewing the worth of a project to firstly consider the project with exact estimates for each future cash flows time and amount. This we can call the *expected result*. The next step can then be to consider the impact of changes to the major influencing cash flows – one by one they are changed and the impact of these changes are calculated. This we will call *sensitivity analysis*. Computer spreadsheets such as Lotus 1-2-3™ and Excel™ have facilitated this work.

The next stage of the analysis can be to see how the expected variation of the cash flows will influence the results when they are all allowed to vary ie. how will they be likely to fit together and thus what will be the combined results of the variations in the individual cash flows. This is what *Risk Analysis* is about.

The aim will be to get measures of chance (out of 100) that a measure of worth of the investment will reach a certain level. In the *RiskAn* program it will be possible to get measures of chance for the following measures of investment worth :-

- ❖ Margin
- ❖ NPV
- ❖ IRR

It will also give measures of *Average, Maximum and Minimum Cumulative Cash Flow at each period* of the investments life.



## **Method Of Analysis**

This chapter describes simulation through the Monte Carlo method. Data is set up and rolls of a dice are used to determine chances.

### 3.1 Monte Carlo Method

It is obvious that analysis of probability models of even small investments cannot be done expeditiously by hand calculation – the volume of calculations is too great. An alternative method of analysis is to use the *Monte Carlo* method. In essence what it says is that if we take sufficient random samples of cases from the model then the results of these cases will fall into a pattern which will be how the variables are likely to combine.

*The process can be seen as 6 steps , as follows :-*

**Step 1** Set up the investment pattern and assign variation to those cash flows which are likely to vary. (See section 6 for further notes on the method of assigning variation).

**Step 2.** Select one case (at random) from the investment pattern , ie. a value at random for each cash flows amount and time. A full case must be picked and it must be picked at random.

**Step 3.** On the selected case in step 2. work out the investment measures and store the results of this trial.(eg. work out the NPV on the case and store this result.)

**Step 4.** Repeat steps 2. & 3. a significant number of times (100 or 200 trials are sufficient).

**Step 5.** From the records in step 3. work out the cumulative % occurrence of the measure (eg. what

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chance was there from the trials of getting a certain level of NPV?).

**Step 6.** Show these results in some communicable way – a graph or table of % cumulative occurrences.

## 3.2 Example for the trial use of the Monte Carlo Method

To illustrate the use of the method we will take the case of *Payout* on a project (this being the time it takes to get the invested money back out of the project). In this case we will use chances in 6 as we will use a dice for the generation of random numbers. The allocation of chances in 6 for the amounts and times in this example has been done purely for illustration. See section 6 for notes on how to do this on a real project.

**Step 1.** Set up the investment pattern and allocate variation to the flows.

Flow number	Amount Data	Amount Chances in 6	Die Face Allocation for Amounts	Time Data Years	Time Chances in 6	Die Face Allocation for Times
1.	-1000	6 in 6	N.A.	0	6 in 6	N.A.
2.	+200	2 in 6	1, 2	1	3 in 6	1, 2, 3
	+300	4 in 6	3, 4, 5, 6	2	3 in 6	4, 5, 6
3.	+100	3 in 6	1, 2, 3	3	2 in 6	1, 2
	+300	3 in 6	4, 5, 6	4	4 in 6	3, 4, 5, 6
4.	+100	1 in 6	1	5	3 in 6	1, 2, 3
	+200	5 in 6	2, 3, 4, 5, 6	6	3 in 6	4, 5, 6
5.	+200	4 in 6	1, 2, 3, 4	5	3 in 6	1, 2, 3
	+300	2 in 6	5, 6	6	3 in 6	4, 5, 6
6.	+200	5 in 6	1, 2, 3, 4, 5	7	3 in 6	1, 2, 3
	+300	1 in 6	6	8	3 in 6	4, 5, 6
7.	+200	3 in 6	1, 2, 3	9	4 in 6	1, 2, 3, 4
	+300	3 in 6	4, 5, 6	10	2 in 6	5, 6

In each case *the cash flows are independent* of each other and there is no amount and time relationship.

**Note :-** *Payout* is the time at which all of the cash put into the project is returned.

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### Steps 2,3,& 4.

These steps call for picking cases at random from the table in step 1. – then working out the payouts for each of the cases then making a record of these results. These results are shown in the table below.

Year of Cash Flow	Trial 1.	Trial 2.	Trial 3.	Trial 4.	Trial 5.	Trial 46.	Trial 47.	Trial 48.	Trial 49.	Trial 50.
0	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000
1			+300		+200					
2	+200	+300		+300						
3		+100	+300		+300					
4	+300			+100						
5	+200	+200	+200		+200					
6	+200	+300	(+200)	+200 +200	+200					
7	(+200)	(+200)								
8				(+200)	(+200 )					
9										
10										

(Brackets show the point of time for payout)

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**Step 5.** The results of the first 45 trials were as follows :-

<u>Payout Year</u>	<u>No. of occurrences</u>	<u>Cum. % occurrence</u>
5	1	2
6	13	31
7	15	64
8	9	84
9	4	93
10	3	100

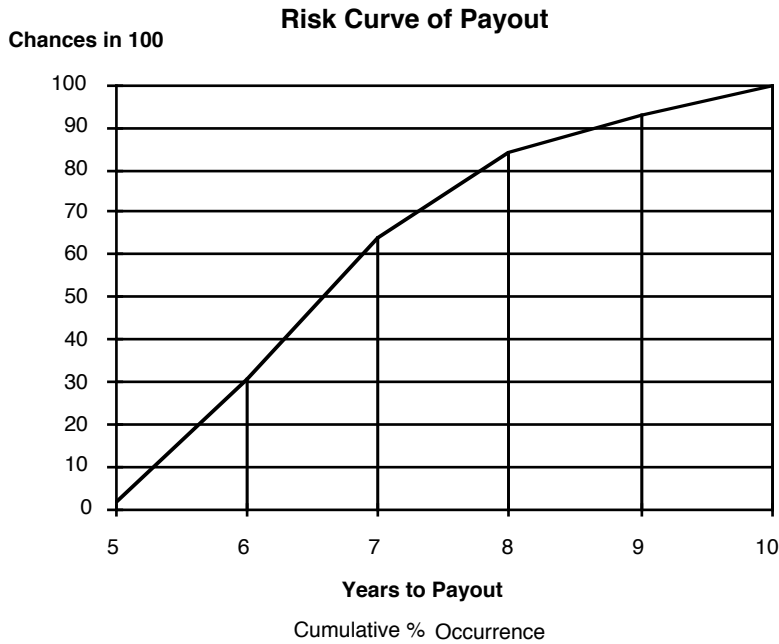
Please now do trials 46-50 and add the results to the 45 above. Then recalculate the cumulative % occurrence. Plot the results of this on the graph showing Payout Year vs Chances in 100 of getting Payout by that Year.

### **Step 6.**

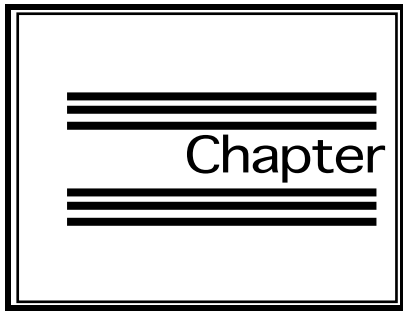
Show the results in some format which is easy to understand. Below is a graph of the results showing the chances in 100 of getting Payout on or before a given year.



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What this says is the same as the previous table. We are certain to get our money back by year 10. We have no chance of getting our money back before year 5. There is 50/50 chances we will have our money back between years 6 and 7. If we needed to be certain to have payout by year 8 then we would fail this as there are only 84 chances in 100 that this will occur.

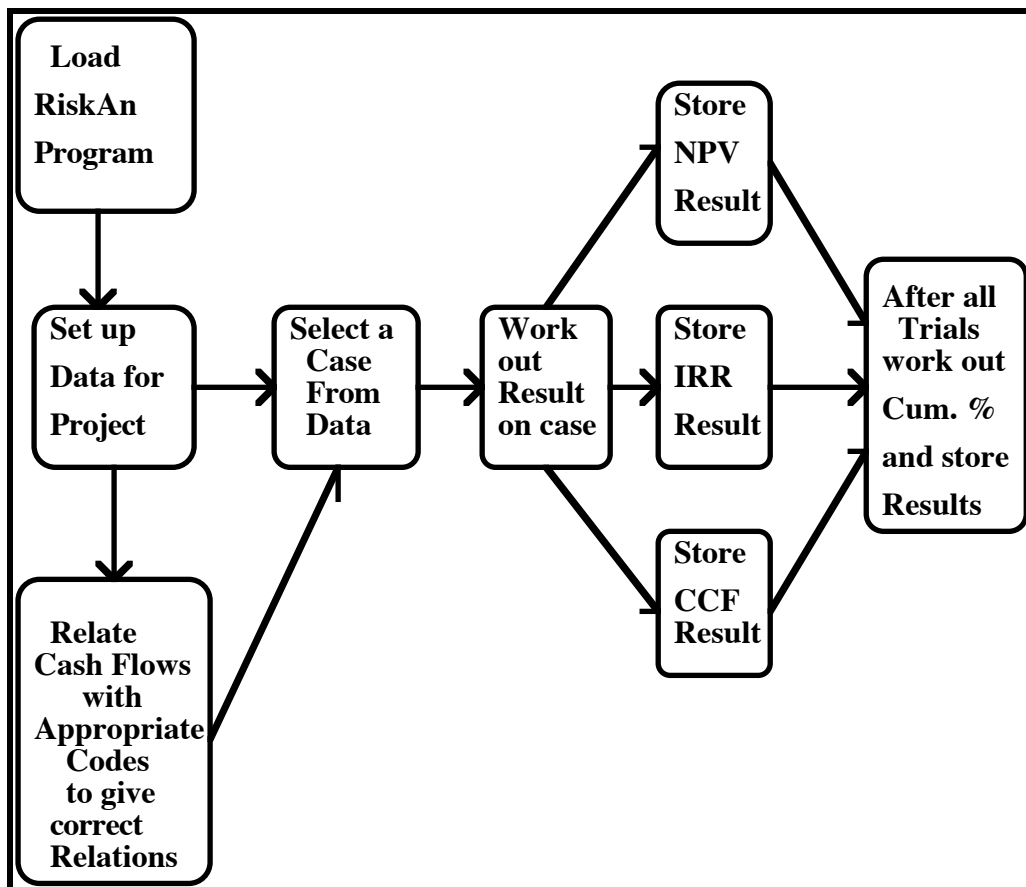


## **Block Diagram Of Program Operation And Notes On Data Storage**

This chapter shows us the steps in entering the data, what data needs to be entered and how you might use the program.

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The program *RiskAn* will follow the 6 steps covered in the previous section. However it will not calculate Payout it will concentrate on the Discounted Cash Flows (DCF) measures of Net Present Value (NPV) and Internal Rate of Return (IRR) – as well it will calculate Cumulative Cash Positions and hence the range of Payouts and Margins and period by period Cash Positions.



The Relationships between the cash flows are very important. It is rare that a project will be made up of independent cash flows. *RiskAn* allows for the relationships between cash flows in both or either amount to amount or time to time. It also allows for the relationship of amount to time within a cash flow. This is done in the program by the method of data

## RiskAn User Guide

storage and the repetition of random numbers used in the selection of amounts and times.

## 4.1 Notes On Cash Flows Data Storage

### *Cash Flows Data*

For each cash flow four pieces of information are stored in a data array. These are

1. **Cash Flow Number** – sequenced by the program, no specification required.
2. **Amount Data** – each level of amount the specific Cash Flow can be with the associated chance in 10 that it can be that level. Obviously for each specified Cash Flow the chances in 10 must add to 10. This specification is to be Amount and its associated Chance in 10. For any Cash Flow this is to be repeated until the Chances in 10 add to 10 (and not more than 10). Outflows are to be input with a negative sign – inflow are to be left unsigned. If for example we wished to tell the computer that a cash flow had an amount value of -200 with 5/10 , -250 with 3/10 or -300 with 2/10 then it would be specified as -200 with 5 probability, then, -250 with 3 probability and finally -300 with 2 probability.
3. **Time Data** ;– the same as for the amounts – Month (or Year), Chance in 10 – all times are to be in months (or years) – the program is designed for use with either monthly or yearly cash flows. In the issued versions of the program the range of allowable periods for specification is 0 to 199. This time range is normally sufficient. If you are dealing with a project and

wish for some good reason to extend the period of time beyond period 199 then fix all the cash flows after period 199 in amount and show them at period 199 at their discounted value.

**4. Relationship** of this cash flow to the previous cash flow or internal to this cash flow. This is described in Chapter 5.

The program is configured to allow for up to 400 cash flows and each of these can have up to 10 different values in both time and amount. In each case the value has a corresponding chance in 10 for occurrence.

To facilitate the preparation of cash flow data prior to computer input it is as well to prepare the data in a format which will follow the computer request. To help with this we have designed a simple sheet for cash flow data preparation and this is shown in Appendix 1.

### 4.2 Method of storage of Cash Flow Data

When the computer program stores the data on Cash Flows amounts and times it does so in the following conceptual way. It has allocated in its storage array for each cash flow 10 places to store data for cash flows amount and 10 places for the times. As a Cash Flow is specified these places are fill up with the specified values and times. Say for example we were specifying the 21 st Cash Flow and we had decided to allow three level for the amount -200 , -220 or -240. We had also assessed the chances in 10 of their occurrence was 3 , 5 and 2 respectively. This would be specified firstly to the computer as -200 , 3 then -220 , 5 and finally -240 , 2. The result of this would be to store in the data storage area for the amount of cash flow 21 -200 in amount locations 1 to 3 , -220 in amount locations 4 to 8 and -240 in amount locations 9 & 10. It is put in the order specified. When the computer comes to choose a value for amount for cash flow 21 for a particular trial it will generate a random number (from 1 to 10) and then look up the value stored in that location number – this will be the value used for that trial for the amount of cash flow 21. The same system applies for the time of the cash flows. There is a separate random number generator for amount and for time.

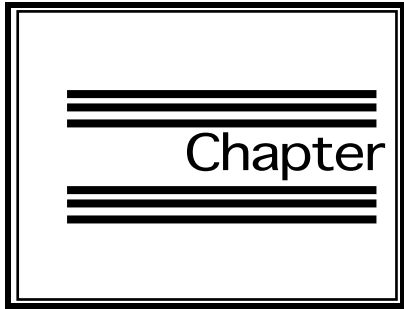
This means that we can relate cash flows which are stored under each other by locking the random number generators on that cash flow. This will relate the cash flow to the previous cash flow. Any require combinations of locking can be specified and the locking can continue on over a number of cash flows.

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It also means that when inputting the data we need to specify cash flows which are related under each other otherwise we will break the relationships. This is not difficult as they are normally thought about together. The program also allows for the modification of data that needs adjustment. Section 5. immediately below covers the possible relationships and their specification.

The same system applies for the storage of data on the times of each cash flow. These are stored in either months or years as has been specified in the initial settings for the analysis.





## **Cash Flow Relationships**

This chapter describes the types of relationships between cashflows that make up an investment.

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As discussed in the previous section it will be necessary to specify for each cash flow the relationship this cash flow has to the previous cash flow and/or how the amount and time are related. *RiskAn* program allows the user to specify one of 6 alternatives to indicate the required relationship.

The specification to the computer covers :-

1. *Cash Flow number* (sequenced by the computer)
2. *Amounts for the cash flow* and their associated chances in 10
3. *Times for the cash flow* and their associated chances in 10
4. *Relationship of this cash flow* to the previous flow or its time amount relationship.

In this section we are dealing with the *relationships between cash flows*.

**Case 1. (N) = Not related in either amount or time.**

This means that new random numbers will be generated for the selection of both the time and the amount – this cash flow is thus independent of previous cash flow and is not related internally time to amount.

**Case 2. (A) = Amounts only related.**

This means that for this cash flow the random number used for the previous cash flow's amount will be repeated – there will be a new random number generated to select time. This means that the amount of this cash flow will be related to the previous cash flow.

**Case 3. (T) = *Times only related.***

This means that for the selection of the time of this cash flow the random number from the previous flow will be used – there will be a new random number generated for the selection of the amount. This means that the time of this flow will relate to the times of the previous flow.

**Case 4. (AT) = *Amounts and times are both related.***

This means that for the selection of the amount and the time for this cash flow the random numbers from the previous flow will be used – there will be no new random numbers generated for selection. This will mean that this cash flows amount and time are related to the previous cash flow.

**Case 5. (X) = *Amount and time of this cash flow are related to each other.***

This means that for this cash flow there will be a new random number generated for the selection of amount and this same random number will be used for the selection of the time of the cash flow. This will mean that the amount and the time of the cash flow are related.

**Case 6. (AX) = *Amount of this cash flow relates to previous cash flow and then this relates to the time of this cash flow.***

This means that for the selection of the amount of this cash flow the random number from the previous cash flow will be used and this same random number will then be used to

## RiskAn User Guide

select time. This connects this cash flows amount to the previous cash flow's amount and also to the time of this cash flow.

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*In diagrammatic form the relationships can be shown as follows :-*

**Case 1. (N) = Not related in either amount of time.**

Flow 1.	A	T	
Flow 2.	A	T	N

For flow 2 . new random numbers for selection of both time and amount and thus independence from flow 1.

**Case 2. (A) = Amounts only related.**

Flow 1.	A	T	
Flow 2.	A	T	A

For flow 2. amount use the same random number as for flow 1. Use a new random number for time. ie Flow 2. amount is governed by the amount of flow 1.

**Case 3. (T) = Times only related.**

Flow 1.	A	T	
Flow 2.	A	T	T

For flow 2 amount selection use a new random. For flow 2 time selection use the random number used for selection of flow 1 time. ie flow 2. time governed by flow 1.

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**Case 4. (AT)** = *Amounts and times are both related.*

Flow 1.	A	T	
Flow 2.	A	T	AT

For flow 2 do not generate new random numbers for either amount or time. Use the same random numbers as for flow 1. Flow 2. time and amount both governed by flow 1.

**Case 5. (X)** = *Amount and time of this cash flow are related to each other.*

Flow 1.	A	T	
Flow 2.	A	T	X

For flow 2. a new random number is generated for selection of amount and this then on used for flow 2. time selection. This relates flow 2. time and amount.

**Case 6. (AX)** = *Amount of this cash flow relates to previous cash flow and then this relates to the time of this case flow.*

Flow 1.	A	T	
Flow 2.	A	T	AX

For flow 2. amount selection use the same random number for amount as flow 1. This same random number then on used for selection of time on flow 2. This relates the amount of flow 2. to amount of flow 1. and also to time of flow 2.

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*How common are each of these relationships ?*

(N) - Most common

(A) - Fairly common

(T) - Fairly common

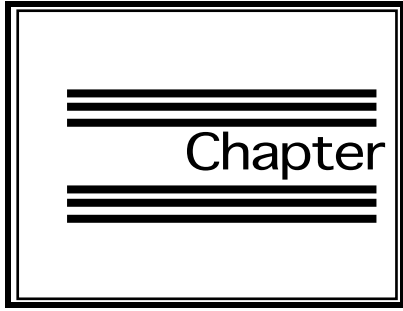
(AT) - Not common

(X) - Rare

(AX) - Very rare

It is important that the correct relationships between the cash flows be recognised as it will impact on the results. Project investments are usually related cash flows – it is rare to find an investment which has all independent cash flows.

As experience is obtained in the coding of the data then so to does the ease of relating the flows.



## **Assigning Variation To Cash Flow Times And Amounts**

This chapter looks at the issue of variation. Variation can occur in size, range and skew.



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*Each Cash Flow in any project will need specification for Variation in Amount and Time.* If a cash flow is fixed at a value then this will be specified as having 10 chances in 10.

The method of assigning the variation to the amounts and times is to examine the attributes of a distribution – we are attempting to fit to the cash flow's amount and time a distribution. The four characteristics of a distribution we are interested in are the *Range*, *Centring point* (e.g. Modal Value) , *Skew* and the *Degree Of Central Tendency* (e.g. Standard Deviation). If we think about these attributes one by one we can arrive at a distribution which will be what we are after. Some people suggest that by admitting a variation we are being very inaccurate in our approach to assessment of a project. It is evident that the use of a single value for an amount and/or time is less sensible.

### **6.1 Range of the Variable**

Seek out the realistic lowest and highest value of the item (earliest and latest in the case of time). The less we know about the estimate then the wider will be the range we apply to the item. Where an item will have a large impact on the analysis then seek help with those who have more detailed information about the estimate. Use the approach of questioning them about each of the attributes of the distribution.

### **6.2 Modal Value and Skew**

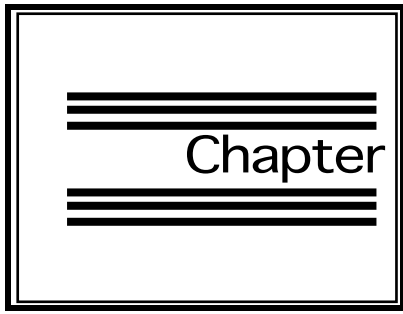
Estimate the most likely value the variable will take – also consider if it is likely to skew to the top or bottom end of the range or if it will be centrally distributed about the middle of the range. This modal value should have been the value used in the original assessment using exact value for the variables – if this has changed due to more work being done on the estimates then so be it.

### **6.3 Central Tendency of the distribution**

This is looking at how much weight will be put on the middle of the distribution and on the extremes. For a distribution with even weights over the full range then if we have allocated 5 value the distribution might be a 2,2,2,2,2. For a distribution peaking about the central point and if we were working on 3 values then the distribution might be 2,6,2. And so on.

### **6.4 Distribution Determination**

If the four items discussed above have been covered well there will be little difficulty in assigning the weights to the different values of the distribution. It seems that most people have difficulty with this step of Risk Analysis only in prospect – when they come to apply the weights to a specific case they have no difficulty. Naturally the application of these weights is of great importance to the results. The more variation put into the estimates then the wider will be the spread of the results. Often we start by running the assessment with wide ranges in all of the major variables and then if necessary go back and spend more time on the estimates to reduce the range of the variables to see the impact on the results.



## **Risk Vs Uncertainty**

This chapter helps you differentiate between Risk and Uncertainty and suggests ways they may be applied to your analysis.

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It is important to distinguish between *RISK* and *UNCERTAINTY* – we will say we are in a *RISK* situation when we can ascribe variation to cash flows and assign chances in 10 for the amounts and times – we will say we are in an *UNCERTAIN* situation when things can either happen or not happen and we have no measures of their probability of so happening.

Where *UNCERTAINTY* is encountered then the best approach is to break the analysis into a number of scenarios – predicate that some thing has occurred or has not occurred and then on the basis of this analyse for *RISK*.

An example might be where there is *UNCERTAINTY* about the rate of inflation over say the next 5 years. You have no measures of probability that it will be 4 %, 6% or 8%. Rather than attempt to input these 3 rates in one *RISK* run it would be better to look at the 3 cases separately – Case 1. If the inflation is 4% – Case 2. If the inflation is 6% – Case 3. If the inflation is 8%.

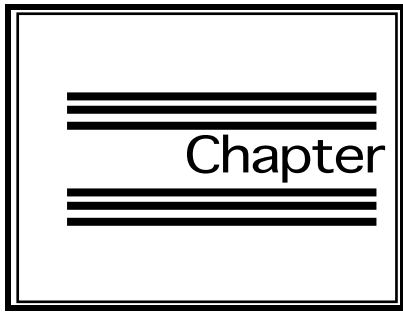
This idea of looking at separate cases around a central theme is also valuable in sorting out those items which are critical to the success of the project. If in the inflation cases referred to above it turned out that the only viable case was where there was an inflation rate of 8% then that become a critical element in the decision making about the worth of the proposal. If on the other hand all 3 cases were OK then inflation rate is not a critical element in the analysis.

Generally not enough analysis of various scenarios is undertaken by analysts. More often only one case is

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looked at and on the basis of this a decision is made without considering other scenarios. This area can usually be improved in project analysis.





## **Notes On The Use Of RiskAn**

This chapter explains the program elements used in RiskAn to enter and manipulate the data. It explains the windows, buttons and menu options.

# RiskAn User Guide

## *Introduction*

RiskAn is extremely “user friendly”, there is even a help option available in the program (for the MacOS version it is available from the □ menu).

There are a few general rules which it will be useful to review before the program is used. These are as follows :-

As the storage arrays are set in size in the initial program statements and in some of the handling statements then there are maximum sizes for the following items :-

- ❖ Months (or Years) (199)
- ❖ Cash Flows (400)
- ❖ Iterations or Loops (400)

The program is driven via a series of windows. Following is a picture and description of each of the windows and their use.



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**“Description”** allows for you to give any name your like to the cash flow being entered. Leaving this blank will not affect the analysis. If it is filled in when the data is printed out these descriptions will be printed.

The 11 buttons shown in the bottom right hand of the window are self-explanatory.

**“Analysis”** will cause the analysis of the IRR, NPV and Cash Position for the data in the memory.

**“Mgn Array”** will repeat the analysis with the NPV discount rate set to almost 0 (thus the NPV becomes the margin), the margin results will turn up as the NPV.

**“Reports”** will take you to the results. This will only contain results if the data has been analysed.

**“Insert”** moves the current cash flow (and all subsequent cash flows) down one and gives a fresh space to input a cash flow. “Insert” is useful when there is a dependent cash flow which has to be placed after the cash flow on which it depends and it has been forgotten.

**“Duplicate”** adds another cash flow the same as the one showing – the cash flow number goes up by one. “Duplicate” is useful when there are cash flows which are similar and only need minor modification change eg. a month number.

**“Remove”** wipes out the current cash flow and moves all of the following cash flows up one.

**“Goto”** will lead to a window asking for the cash flow number you wish to jump to.

**“<|”** takes you to the first cashflow (cash flow 1)

**“<<”** takes you back to the previous cash flow.

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“>>” takes you to the next cash flow to be created, or if there is a cash flow already created, to the next cash flow.

“>|” takes you to the last cash flow in the cash flow stream.

The windows icons on the top right hand corner of the window follows the normal use pattern of zooming or closing the window.

## 8.2 Cashflow Entry Window “File” Option

To open this option click on it and run down to the selection you require. It will appear as shown below.

File	Edit	Cash
New		⌘N
Open...		⌘O
Save		⌘S
Save As...		
Page Setup...		
Print...		⌘P
Quit		⌘Q

File	Edit	Cashflow
New		Ctrl+N
Open...		Ctrl+O
Save		Ctrl+S
Save As...		
Print...		Ctrl+P
Exit		Ctrl+Q

“**New**” (Control + N or ⌘ N ) will give you a clean area for data, if you have data displayed it will ask if the current data needs to be saved or not.

“**Open**” (Control + O or ⌘ O ) allows you to take data from file. It will follow the normal Windows (or MacOS) routine to get to the file you require to open. It is suggested below that data be saved with a “.DAT” extension so that you will be able to pick out the data files with ease.

“**Save**” (Control + S or ⌘ S ) will save the current data in the file name and location you have previously specified.

“**Save As**” will save the data with a name you will have to specify. It is an excellent idea to save any data with a “.DAT” extension to allow ease of identification of the data files. The place it will put the file will be the directory you are currently locked into. If you wish to go

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to another directory, then specify that in the normal way.

**“Print”** (Control + P or ⌘ P) will print the cash flow in display.

**“Exit”** (Control + Q or ⌘ Q) is the way to close down the program. If data has not been saved, then it will ask if you desire to save the current data.

### 8.3 Cashflow Entry Window “Edit” Option

Selection of this option will lead to the window shown below.

<b>Edit</b>	<b>Cashflow</b>	
Undo	⌘Z	
Cut	⌘H	
Copy	⌘C	
Paste	⌘V	
Clear		
Select All	⌘A	
Preferences...		

<b>Edit</b>	<b>Cashflow</b>	<b>Perforr</b>
Undo		Ctrl+Z
Cut		Ctrl+X
Copy		Ctrl+C
Paste		Ctrl+V
Clear		
Preferences...		

“**Cut**” (Control + X or ⌘ ) will delete the item the item you are currently positioned at place it on to the clipboard for possible later pasting.

“**Copy**” (Control + C or ⌘ ) will copy the item on to the clipboard for possible later pasting to another place

“**Paste**” (Control + V or ⌘ ) will put the item on the clipboard to the position where the cursor is positioned.

These three options will find use in the “Cash flows Report, IRR Report, NPV Report and Cash Position Report” when you wish to paste any of these to a spreadsheet for graphing.



## 8.4 Preferences

Edit Cashflow	
Undo	⌘Z
Cut	⌘H
Copy	⌘C
Paste	⌘V
Clear	
Select All	⌘A
Preferences...	

These six items of information are essential for the analysis of the data. They will show up like the window below. The defaults are shown as below with the exception that the date will be the current date on the computer.

Preferences			
Analysis Name	Untitled		
Analysis Date	24/9/96	Number of Loops	200
Units to be used	\$1	P.V. Discount Rate	25.0000
Cashflow timing	<input checked="" type="radio"/> Month <input type="radio"/> Year		
		Cancel	OK

**“Analysis Name”** – use any relevant name.

**“Analysis Date”** – leave the default or change as necessary

**“Units to the used”** – put in some notation to show the units in which the data is scaled. Notice that this will only be used as a heading and will not scale the data – data scaling comes from the position of the decimal point in the data input.

**“Loops”** – this is the number of times that the data is to be sampled. It is suggested that a minimum

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of 200 be processed and there is an upper limit of 400 in the program, the default of 200 will be fine.

**“Cashflow Timing”** – select either Month or Year depending on the period used for the project.

**“P.V. Discount Rate”** – use the rate you desire. In the case of cash flows being monthly, the rate to be used will be the annual rate eg. 24% will case the discounting to be at 2% per month. In the case of cash flows being on yearly intervals then the rate put in will be the rate used for the discounting.

## 8.5 Cashflow Entry Window “Cashflow” Window

Cashflow	Perf	Cashflow	Perform
Previous	⌘1	Previous	F1
Next	⌘2	Next	F2
Insert	⌘3	Insert	F3
Remove	⌘4	Remove	F4
Duplicate	⌘D	Duplicate	Ctrl+D
Goto...	⌘G	Go to...	Ctrl+G

They allow you to do the same options with respect to a cash flow as previously described under the “Cashflow Entry Window”. They are the same functions as provided in the options shown in the bottom right hand side of the window. These are as follows:-

“**Next**” moves you on to the next cash flow in the series – if there has not been a cashflow created for that number it gives a fresh place to create a new flow.

“**Previous**” will take you back to the cash flow previous to the one you are at.

“**Insert**” moves the current cash flow (and all subsequent cash flows) down one and gives a fresh space to input a cash flow. “Insert” is useful when there is a dependent cash flow which has to be placed after the cash flow on which it depends and it has been forgotten.

“**Duplicate**” adds another cash flow the same as the one showing – the cash flow number goes up by one. “Duplicate” is useful when there are cash flows which are similar and only need

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minor modification change eg. a month number.

**“Remove”** wipes out the current cash flow and moves all of the following cash flows up one.

**“Goto”** will lead to a window asking for the cash flow number you wish to jump to.

**“<|”** takes you to the first cashflow (cash flow 1)

**“<<”** takes you back to the previous cash flow.

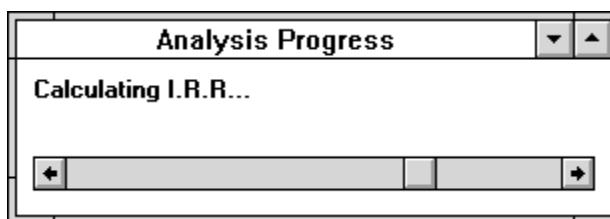
**“>>”** takes you to the next cash flow to be created, or if there is a cash flow already created, to the next cash flow.

**“>|”** takes you to the last cash flow in the cash flow stream.

## 8.6 Cashflow Entry Window Perform Option

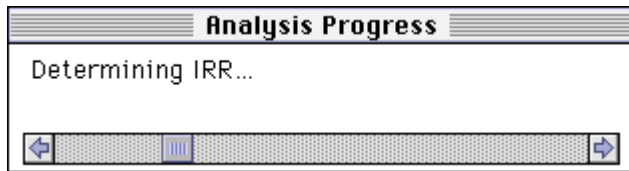
Perform	Font	Size	s	Perform	Help
Analysis		¶L		Analysis	Ctrl+L
Margin Array		¶M		Margin array	Ctrl+M
Cashflows Report				Cashflows Report	
IRR Report				IRR Report	
NPV Report				NPV Report	
Cash Position Report				Cash Position Report	

This option will be used when you need to have an overview of cash flows and you desire to undertake analysis of your data. In which case the cash flows and the results can be sent to a printer and can be edited as described under the “Edit” option. The following describes the various options:-



**“Analysis”** – calling for this option will lead to the data being sampled the number of times that has been specified in the “Preferences” option of the “Edit” function. The results will then be shown in three windows. These results are saved in files named “RiskAn.IRR”, “RiskAn.NPV” and “RiskAn.POS”. Each time the analysis is undertaken, these files are overwritten. If you wish to save results from a particular analysis then simply rename these files.

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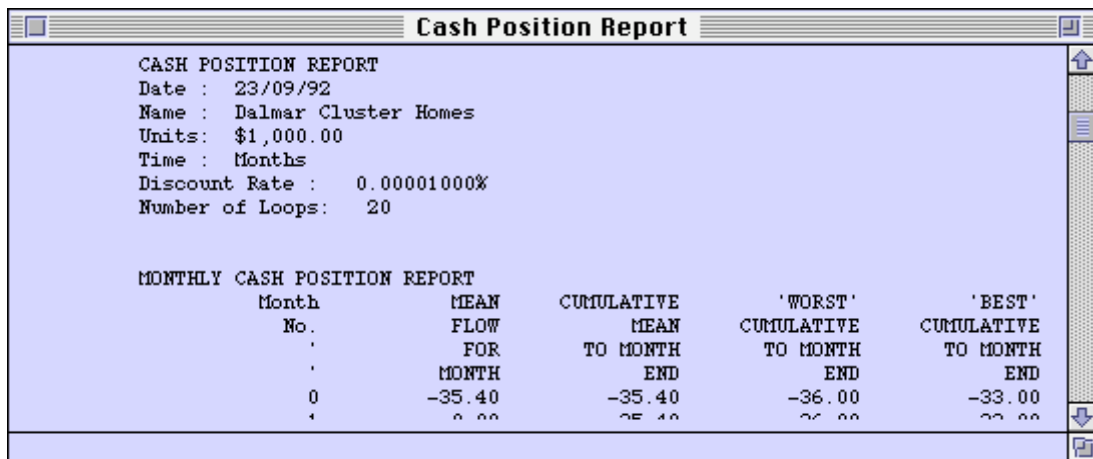
**“Margin Array”** – calling for this option will lead to the analysis of the data with the PV Discount Rate set to a very low figure (0.00001). The result of this is that the NPV results will be the results of the variation of the margin. This comes about by the fact that when the discount rate approaches zero there is no discounting and the NPV will become the margin. In doing this calculation the analysis will repeat the IRR and the cumulative cash flow analysis. These results are stored in files called “RisMargn.IRR”, “RisMargn.NPV” and “RisMargn.POS”. If you wished to save results from a particular analysis then simply rename these files.

FLOW No	AMOUNT	PROB	TIME	PROB [N]	[A]	[T]	[AT]	[X]	[AX]
Test 1									
1	-33.00	5	0	10	N				
	-36.00	5							
Test 2									
2	-297.00	5	3	10	A				

**“Display Cash flows”** – calling for this option will lead to the cash flows being displayed. If any of these need modification then it will be necessary to return to the “Cashflow Entry” window, “Go to...” that cash flow and make

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the change. These cash flows can be sent to the printer with the “Print” option. They could also be fully or partly selected and that can be placed on the clipboard using the “Copy” option of the “Edit” function. From the clipboard they could be pasted to anywhere so desired. The cash flows data is saved in a file called “RiskAn.CFL”. Each time new data is created this file is overwritten. If you have failed to save the data then it is in the “RiskAn.CFL” file.



Date :	23/09/92
Name :	Dalmar Cluster Homes
Units:	\$1,000.00
Time :	Months
Discount Rate :	0.00001000%
Number of Loops:	20

Month No.	MEAN FLOW FOR MONTH	CUMULATIVE MEAN TO MONTH END	'WORST' CUMULATIVE TO MONTH END	'BEST' CUMULATIVE TO MONTH END
0	-35.40	-35.40	-36.00	-33.00
1	0.00	35.40	36.00	33.00

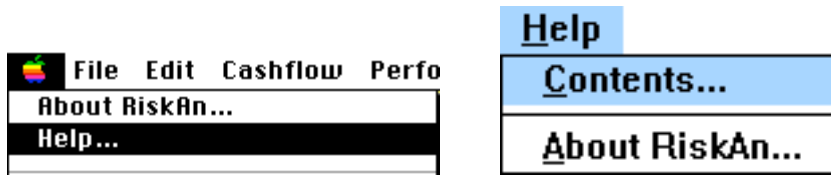
**“Display Results”** – calling for this option will lead to the Results being displayed (assuming that the analysis has been performed). These results can be sent to the printer with the “Print” option. They could also be fully or partly selected and that can be placed on the clipboard using the “Copy” option of the “Edit” function. From the clipboard they could be pasted to anywhere so desired. The results are saved in a file called “RiskAn.RES”. Each time new data is created this file is overwritten. If you wished to save the results from a particular analysis then simply rename this files.

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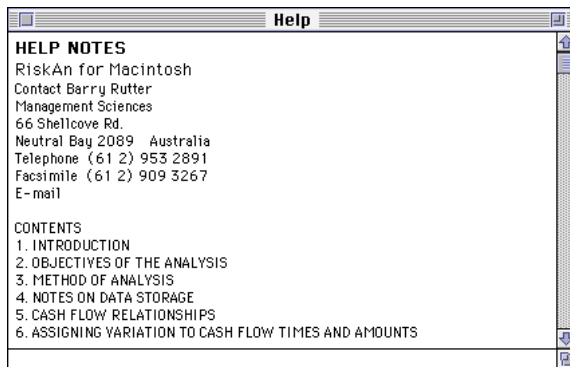
The results will be in the form of tables. If you wish to turn these into graphs or diagrams via a spreadsheet program (such as Excel™), then go out of the RiskAn program, open up an Excel spreadsheet and open the “RiskAn.RES” file (or “RisMargn.RES”) under the “all files” option. Depending on the version of Excel you have then you will take different actions. For Excel 4 you will need to “Parse” some of the data under the “Data” option (don’t forget to select only the one column containing the data). For Excel 5 the field delimiter will be a “space” and follow the step by step process. Use the graphing tool for the preparation of the graphs.



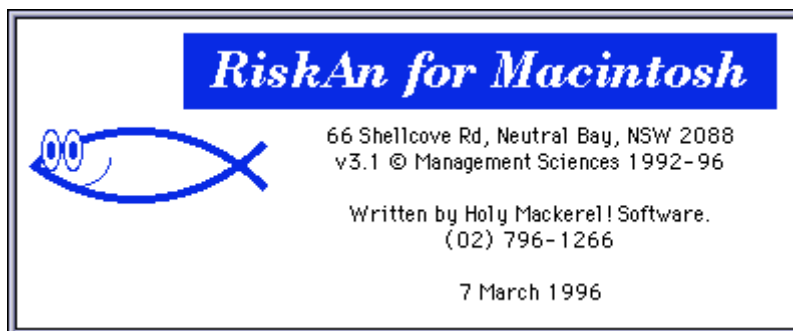
## 8.7 Cashflow Entry Window Help Option



The window for this option is shown below. The two windows follow the normal windows routine.



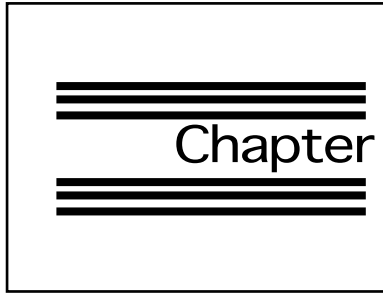
Calling for the “*Help*” option will take you into a description of the program and actions to be taken. This is in a book style and as it is small it is not cross referenced. Read the “Table of Contents” to find the area where your query lies and then scroll through to the area covering the matter.



Calling for the “*About RiskAn*” option simply takes you back to the opening window which came up when

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the program was initially opened. As shown on the bottom of this page.



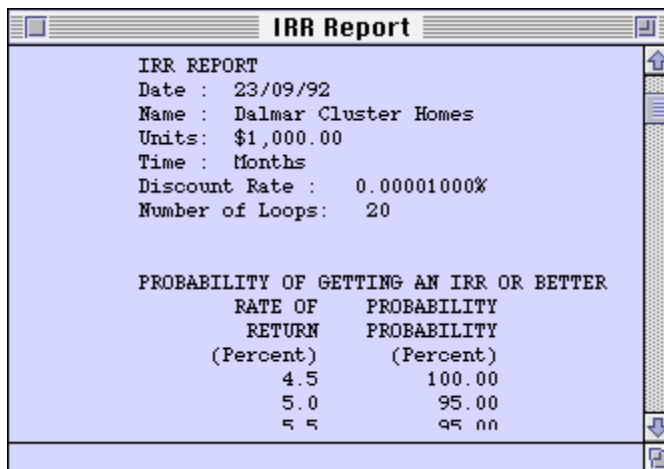
## **Result Format And Meaning**

This chapter explains the reports produced by RiskAn. It describes IRR, NPV, Cumulative Cash Flow and Margin.

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Appendix 4. shows the data for a typical run of a project on the computer. Appendix 5. shows the results of the computer run. It is as well to remember the results are an analysis of the problem so listed – if there have been errors in data input then these will be influencing the results. It is therefore as well to check the data to see if there are any errors – the usual errors are negative signs omitted and decimal points in the wrong place.

## 9.1 Internal Rate Of Return Results



The screenshot shows a window titled "IRR Report" with a light blue background. It contains the following text:

IRR REPORT  
Date : 23/09/92  
Name : Dalmar Cluster Homes  
Units: \$1,000.00  
Time : Months  
Discount Rate : 0.00001000%  
Number of Loops: 20

Below this is a table titled "PROBABILITY OF GETTING AN IRR OR BETTER".

RATE OF RETURN (Percent)	PROBABILITY PROBABILITY (Percent)
4.5	100.00
5.0	95.00
5.5	95.00

This is the first window of results to be shown. It will list the % cumulative occurrence for each 1/2 % of IRR over the full range it computed IRR's. It will count negative IRR's as zero and any IRR above 128% will be counted as 128%.

In making up these results the computer has taken each trial and worked out the IRR of that trial. These results have then been sorted and % cumulative occurrences have been calculated. What this is saying is the chance you will have in 100 of getting to a specified level of IRR or better. IRR is the discount rate which will lead to zero NPV. If you are working in months then the reported rate will be a PA rate based on monthly adding of interest eg. a reported rate of 24 % PA means 2 % per month.

Remember that there are many difficulties with the use of IRR as an investment worth measure – you are far better to concentrate on the NPV of the project at your nominated reinvestment rate.

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These reported values can be taken and turned into a graphical presentation of the same data. This can be done by taking the results of the run (stored in a file called “RiskAn.IRR” ) and opening “RiskAn.IRR” in a spreadsheet, then use the graph package in the spreadsheet program to show the data diagrammatically. If it is Excel then open the Excel program and open “RiskAn.IRR” under the “all files” option. For Excel Version 4 it will be necessary to “Parse” the data to split the data (which is all in one column) into separate columns. For Excel Version 5 there should be little difficulties – follow the requested steps.

As each time the program is run the “RiskAn.IRR” file is overwritten it will be necessary to rename the file, before another program use, if the results are to be kept. Alternatively file the spreadsheet carrying the results under an appropriate name. If you have nominated a specific discount rate for the preparation of a NPV profile then the chance of getting an IRR of that value or better will be the same as your chance of getting a zero NPV or better (positive).

## 9.2 Net Present Value

NPV Report	
NPV REPORT	
Date : 23/09/92	
Name : Dalmar Cluster Homes	
Units: \$1,000.00	
Time : Months	
Discount Rate : 0.00001000%	
Number of Loops: 20	
RESIDUAL N.P.V. REPORT	
VARIATION IN RESIDUAL N.P.V. M.R.	
Probability	or better is
of getting	
72.00	100.00
93.10	95.00
114.20	95.00

This window is showing the chances of getting to a specified residual NPV or better. Each of the iterations or trials have been discounted at the specified rate and the results of the NPV resulting have been sorted into 20 intervals of NPV over the full range of values encountered. The 21 NPV levels and their associated % chances of occurrence have then been printed out. The printed output then tells the Maximum and Minimum NPV that is likely to be encountered and allows the construction of a curve of risk for NPV at the specified rate. If you require an NPV output at a different discount rate then the NPV discount rate should be modified and the project reanalysed. These results are stored in a file called “RiskAn.NPV” and can be graphed using the technique described under IRR Results above.

## 9.3 Cumulative Cash Flows

Cash Position Report					
CASH POSITION REPORT					
Date : 23/09/92					
Name : Dalmar Cluster Homes					
Units: \$1,000.00					
Time : Months					
Discount Rate : 0.00001000%					
Number of Loops: 20					
MONTHLY CASH POSITION REPORT					
Month	MEAN	CUMULATIVE	'WORST'	'BEST'	
No.	FLOW	MEAN	CUMULATIVE	CUMULATIVE	
	FOR	TO MONTH	TO MONTH	TO MONTH	
	MONTH	END	END	END	
0	-35.40	-35.40	-36.00	-33.00	
1	0.00	35.40	36.00	33.00	

As the computer does each trial it carries and updates 3 stores pertaining to cash flows. One for net cash flow and the other two for cumulative cash flow. In the first store it sums all of the net cash flows it gets in each trial. It does this period by period. What ends up in each period is the sum of all the iterations values for that period. This is then printed out as a mean cash flow for the period – the total for the period divided by the iterations (loops). This is then converted to Cumulative Mean to the period end. What this tells is the average cash which can be expected to be in the investment at that period. The final figure will be the average Margin on the deal. Where the sign changes (from negative to positive) in this cumulative cash flow will be the average period of payout (or pay back).

In the second store it stores initially the cumulative cash flow for the first trial. When the next trial is picked and it's cumulative cash flow has been calculated, a comparison is made between the currently stored cumulative cash flow amount *for that period* with the new cumulative cash flow at the same period. If the new figure is worse than the previous



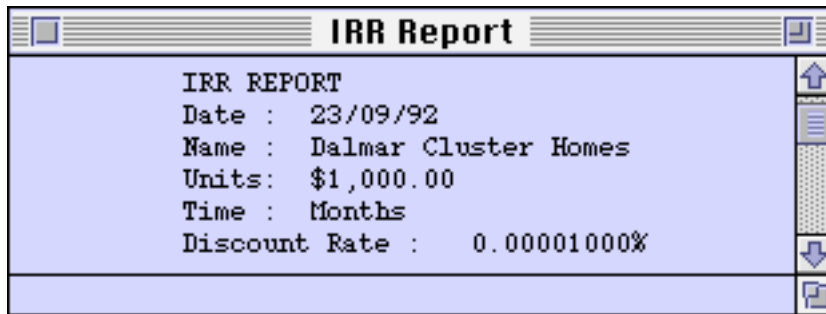
## RiskAn User Guide

figure then the previous figure is replaced with the new figure. By worse we mean a higher negative or lower positive. This process is repeated for the remaining trials and when these are completed the remaining figures in the store are printed out. It should be noted that these do not necessarily represent the absolute worst cumulative cash flow to that period end – they are only the worst that was found in the trials undertaken. What the results show will be the worst Margin , Payout period and Cumulative cash position to each period end.

The third store carries the best cumulative cash position the computer has found to that period end in the trials processed. It is calculated in the same way as the worst with the obvious change of best for worst. The results will show the best Margin, Payout period and Cash position it has found in the trials it has processed.

These results are shown in the third results window and are stored in a file called “*RiskAn.POS*”. Once again this file is overwritten each time the program is run and if you wish to keep the results it will be necessary to rename the file.

## 9.4 Margin

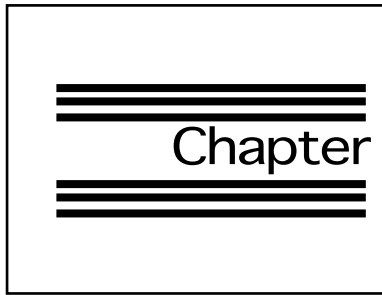


You can obtain a profile of the variation in Margins for the project. By Margin we mean the sum of the undiscounted cash flows for the project. Margin being therefore the difference between the total inflows and outflows for the project.

This is calculated by the computer by putting the Discount rate to a very low figure and thus the NPV becomes the Margin. When the discount rate approaches zero, then, all of the discount factors approach 1, hence discounting for all intents and purposes does not take place.

When this option is called for there will be the calculation of the IRR and Cumulative Cash Flow results and as well the NPV results will become the Margin results. These results are stored in three results files called "*RisMrgn.IRR*", "*RisMrgn.NPV*" and "*RisMrgn.POS*". Follow the same techniques described above to open this file in a spreadsheet and convert it to diagrammatic presentation. Each time this option is used the files are overwritten.

The file you will be interested in for Margin results will be "*RisMrgn.NPV*".



## **Use Of Program For Share Portfolio Analysis**

This chapter examines the use of RiskAn in determining the worth of share market investments. It is easily applied as each cash flow whether in or out has an amount, time, probability and relationship.

### 10.1 Introduction

RiskAn is a general financial analysis program. It has application to share portfolios both for structuring and for comparison of expected results and their associated risk.

The approach will be to make estimates of all of the cash flows arising from the ownership of a share portfolio over a specified period of time and to the make estimates of the likely variation in these cash flow, then, to analyse this for curves of expected performance.

The cash flows to be estimated for each parcel of shares will be as follows:-

- ❖ Net Buy Price (including brokerage and stamp duty)
- ❖ Expected dividend stream over the period of analysis
- ❖ Tax implications of the dividend stream and it franking benefits (if any)
- ❖ Any issues or calls on the share during the period of the analysis
- ❖ Net Income from sale of Shares at the end of the analysis period
- ❖ Tax implication(if any) of the capital gain (or loss) on the share buy price versus sale price.

## 10.2 Example Of Share Portfolio

### Generation Of Data

Data on the net buy price can be estimated from the recent prices for the share achieved in trading. From the trends in recent trading it will be possible to weight the buy price in the direction the share is moving. Add to that the brokerage and any stamp duty applicable to the purchase.

Data on the expected dividend stream should be estimated by looking at the past records of dividends paid. There will generally be a regular time of payment and there will be a pattern in dividend payments. Where it has been erratic in the past then put more variation into the amount of the dividend. Any statements by the company about their expectations of the future can be used to temper the estimates. The less that is known then the wider the variation to be allowed in any estimate.

Tax implications of dividends will follow from the dividend amounts. The timing of the tax implications will be related to the tax payment time (including any provisional and/or “wash-up” taxes). The amount of the tax payment will be governed by the dividend amount, the marginal tax rate and the franking benefit.

Issues and/or calls on the share will be difficult to estimate. Some guidance might come from company statements and past behaviour. Amounts and timing will be needed. These can be wild cards in the

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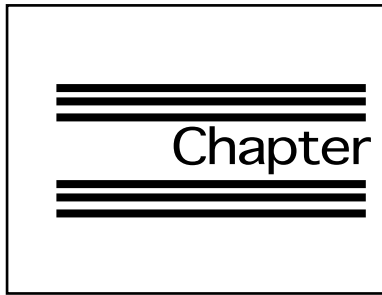
estimates – not generally easy to estimate unless there has been prior announcements.

Net income from the sale of shares at the end of the review period. This will be the estimated sale price less costs associated with the sale (brokerage). This can be estimated by firstly estimating where you expect a relevant index which is associated with the share is likely to be at the point of sale, a range for this might be considered. For example, if the relevant index was now at 2100 and it was expected that in 2 years it could be in a range of 2000 to 2400 with a likely value of 2300. The second step is to then make an estimate of how volatile the particular share has been compared to the index. Does this share show greater or less growth than the index? If the index has moved 10% in the past how far has the share price moved? This should lead to an estimate of the attributes needed to fit a distribution to the estimated share price, range, most likely, weights to give desired skews and central tendencies.

Tax implications of capital gains on the difference between the buy price and the sale price of the share. This will be related to the estimated sale price of the share. It will also depend on the marginal tax rate on average buy price for the share and inflation adjustment (if any). The timing of this will be when the tax is to be paid (including any provisional and/or “wash-up” taxes). In this case it is expeditious to use an average buy price rather than to try to allow variation in buy price, this will be fine as one would expect a small range in the buy price.

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Appendix 3 shows an example of the analysis of a share portfolio. In this case for simplicity the example is done in a before tax mode.



## **Use Of Program For Property Project Analysis**

This chapter examines the use of the RiskAn application in determining property worth. This makes it easier to compare it's worth after changes such as sale, leasing or refurbishing.



### 11.1 Introduction

Property project financial analysis can involve the consideration of the following items :-

- ❖ Margin
- ❖ Cash Exposure
- ❖ Payback time
- ❖ NPV at a specified discount rate
- ❖ NPV Payback time
- ❖ IRR

Usually the ones which get the most attention are NPV, Margin and IRR. All of these can be analysed for Risk using the *RiskAn* program.

The normal method of analysis is to use a spreadsheet program to analyse the project for these measures with exact estimates of the amounts and times of the cash flows. The spreadsheet can then be used to test sensitivity by varying individual cash flows.

If it is decided to undertake risk Analysis the next step will be to code up the cash flows for input into *RiskAn*. This will mean understanding the cash flow relationships and arriving at estimates of the likely variation in each cash flow time and amount. Remember the less known about the cash flow then the wider will be the range applied. Where possible make notes about the reasons for the variation and the source of the estimate.

## **11.2 Application Of The Risk Analysis To A Medium Density Residential Project.**

Appendix 6 shows a spreadsheet financial analysis for a project to build and sell a number of cluster houses. The spreadsheet is configured with time vertically and the cash flow causes in columns. The project is over 19 months and from the final column (Cumulative Cash Flow) it shows a Margin of \$207,000, a Payback Time of Month 18, a Maximum Cash Exposure of \$982,000. In the top left hand corner of the spreadsheet it shows an NPV of \$8,000 @ 20 % pamr and -\$31,000 @ 25 % pamr. The IRR will be of the order of 21% pamr.

In this case the project initiators were aiming for a positive NPV @ 25% pamr. From this measures viewpoint the project had failed (marginally). The project thus needed analysis to see the risk involved.

Appendix 7 shows the coding of the 30 cash flows involved in the project. It was decided that as (at that stage) detailed estimates of the costs had not been completed to give a wide variation in the total costs – these are shown in cash flows 8 to 16. Notice that as we desired the total cost to be up or down and not to vary each month these cash flows are locked to each other in amount. They are also locked in time as the timing of these costs will arise from the build start time – if we start late then we will finish late. Similar reasoning on the sales is shown in cash flows 21 to 25. A wide variation was allow for the sales income as (at this stage) the product was a new idea in this market segment and there had been little Market research to

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tighten the estimates – following the idea that the less you know about an estimate then the wider you allow it to vary.

Appendix 8 shows the results of the *RiskAn* analysis on this project.

The first reported results are those on IRR and what the table and curve says is that we are certain to achieve an IRR of 12% or better. Our chance of getting an IRR of 20% or better is 49% and of 25% or better is only 3%. This project is not looking good – it is much worse than the original spreadsheet analysis showed.

The next report is telling the result for NPV with a fixed rate of discounting of 25% pamr. In this case we have only got 3 % chance of getting a positive NPV (that is zero or better). In the worst case we could lose \$100,000 of NPV (we are certain of doing better than losing \$100,000). There is approximately 50% chance we will lose more that \$50,000 NPV (@ 25% pamr). This is also confirming the project is not likely to achieve the targets set.

The next report is showing the results of the cumulative and net cash flows achieved over the 400 iterations. The second column is showing the average cash movement for each of the months. The third column is a cumulation of the second column. This third column is saying that at month 21 the average margin was \$201,000, the payout time was month 20 and the maximum exposure was at month 14 with an amount of \$980,000. The next column is showing the “worst” cumulative cash flow at that month found in

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the 400 iterations – the margin could be as low as \$126,000, payout as late as month 21 and the maximum cash exposure \$1,035,000 at month 16. The final column shows the “best” cumulative cash flow at that month found in the 400 iterations – the margin could be as high as \$270,000, payout as early as month 17 and the maximum cash exposure \$929,000 at month 14.

What this all said was at this stage of the analysis the project is not meeting the criteria. If there was a desire to do further analysis then the estimate would need to be refined and the analysis run again on *RiskAn*.

### 11.3 Application Of The Risk Analysis To Commercial Property Investment

Appendix 9 shows a spreadsheet financial analysis for a project to buy, refurbish and sell a commercial property. The spreadsheet is configured with time vertically and the cash flow causes in columns. The project is over 26 months and from the final column (Cumulative Cash Flow) it shows a Margin of \$603,000, a Payback Time of Month 26, a Maximum Cash Exposure of \$2,445,000. In the top left hand corner of the spreadsheet it shows an NPV of -\$19,000 @ 12 % pamr and -\$106,000 @ 12 % pamr. The IRR will be of the order of 11.6% pamr.

The strategy in this project is to buy the property, arrange with the current tenants to relocate them within the property while the building is refurbished and to then rent that space which is vacant after refurbishment. When the building is fully leased to then sell the property. The investor was seeking a positive NPV @ 12% pamr (before interest, tax and borrowings), at this stage of the analysis the project is marginally failing.

Appendix 10 shows the coding of the 84 cash flows involved in the project.

Appendix 11 shows the results of the analysis on *RiskAn* for this project.

The first reported results are those on IRR and what the table and curve says is that we are certain to achieve an IRR of 9% or better. Our chance of getting

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an IRR of 12% or better is 90% and of 14% or better is 65%. This project is looking fair there is a good chance that the 12% target will be OK.

The next report is telling the result for NPV with a fixed rate of discounting of 12% pamr. In this case we have only got 90 % chance of getting a positive NPV (that is zero or better). In the worst case we could lose \$121,000 of NPV (we are certain of doing better than losing \$121,000). There is approximately 50% chance we will make more than \$120,000 NPV (@ 12% pamr). This is also confirming the project is likely to achieve the targets set.

The next report is showing the results of the cumulative and net cash flows achieved over the 400 iterations. The second column is showing the average cash movement for each of the months. The third column is a cumulation of the second column. This third column is saying that at month 27 the average margin was \$806,000, the payout time was month 26 and the maximum exposure was at month 11 with an amount of \$2,445,000. The next column is showing the “worst” cumulative cash flow at that month found in the 400 iterations – the margin could be as low as \$806,000 and the maximum cash exposure \$2,510,000 at month 11. The final column shows the “best” cumulative cash flow at that month found in the 400 iterations – the margin could be as high as \$1,062,000, payout as early as month 26 and the maximum cash exposure \$2,382,000 at month 8.

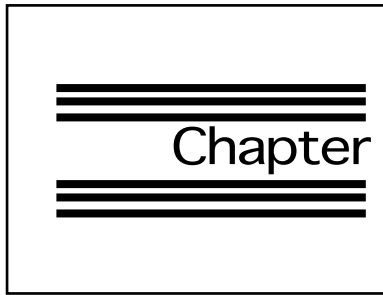
What this all said was at this stage of the analysis the project is close to meeting the criteria. The risk associated with doing the project to meet the criteria is

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small. The propensity to run that risk could be assessed by the project owner.







## **Use Of Program For Property Valuation**

This chapter continues of from the previous one. It helps us value properties especially to determine the worth of refurbishments.

### 12.1 Introduction

It is expected through out this discussion that the party making the valuation (or for whom the valuation is made) is an “interested party” – ie they have some interest in the property – this will mean that as far as this discussion is concerned there is no such thing as the value of a property per se – it is VALUE TO A PARTY WHO HAS AN INTEREST IN THE PROPERTY.

Standard Valuation practice calls for there to be an “Open Market Value” (OMV). Extracts from “Statement of Asset Valuation Practice No 2” define it as follows :-

“The definition of Open Market Value means the best price at which an interest in the property might be reasonably be expected to be sold at the date of the valuation assuming

- ❖ (a) a willing seller
- ❖ (b) a reasonable period in which to negotiate the sale taking into account the nature of the property and the state of the market
- ❖ (c) the values will remain static during that period
- ❖ (d) the property will be freely exposed to the open market, and
- ❖ (e) that no account will be taken of any additional bid by a purchaser with a special interest.”

Notice that this definition says nothing about the buyer – it assumes all potential buyers have the same

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characteristics. It also does not deal with the case of valuation for a party who is not intending the property to be transferred from its current ownership or state. (It must be pointed out however that the various “Statement of Asset Valuation Practices” cover cases associated with non transfer of ownership situations – mostly they come back to OMV however).

In the following discussion we will be reviewing various valuation needs for various parties and the interest the parties will have in the property will cause there to be difference assessments of worth. We will therefore, in certain cases, be moving away from OMV as defined above. Different parties will have different perspective's on the worth of a property to them at that point in time. This worth will arise from their perspective and their characteristics as well as the characteristics associated with the property.

This does not mean that OMV as a concept does not have a use – it is useful within the defined framework as above – its use should fit within that framework. It would seem that there have been many cases where OMV has been misunderstood and perhaps misapplied to situations to which it was not applicable. It might be said that the perspective of the interested party can be covered in the briefing given to the Valuer using the OMV idea – hence the very careful statements in the “Statements of Asset Valuation Practices” pertaining to the release and use of any valuations made.

Appendix 12 shows a block diagram of the application of NPV and Risk Analysis to property valuation.

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"Open Market Value" will find use in the case where the needs are to record and publish the "value" of the property for financial reporting. It will also have use for rate and tax purposes. It will also be useful in legal situations.

Where we are trying to make management decisions about a property (such as its position in a portfolio) then it is better to treat the property as a flow of future cash and thus the "value" of the property will be from the NPV of these cash flows to the interested party.

This idea brings with it two important considerations -

- ❖ What are the estimated cash flows from the property and its proposed use.

Notice that different parties could have different estimates for the future cash flows depending on the planned use of the property. How the property is to be used will determine the flow of cash – different parties could have different ideas for the use of the property, hence different basis for their valuation.

- ❖ What will be the discount rate for the calculation of the NPV of the future cash flows

Notice that different parties can have different time use of money opportunities and thus different discount rates for the calculation of the NPV of the cash flows to arise from the property.

Reading the block diagram, it can be seen that where we are dealing with a property for the purposes of

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decision making and management advice we should be using NPV as the base for valuation. For example, if we were attempting to decide whether we should hold a shopping centre without a major refurbishment, or whether we should undertake the refurbishment then the base for this should be a comparison of the risk curves of the two valuations of the property to the interested party at their discount rate. Similarly if we are deciding whether we should sell a commercial property for an offered price, we are best to decide that by comparing the NPV valuation risk curves of the two alternatives.

## **12.2 Use Of RiskAn Program For Valuation Of A Major Retail Centre**

We will now look at a valuation based on the NPV of expected future cash flows arising from the ownership of a major retail centre.

The cash flows associated with the analysis will be :-

- ❖ Year by year expected net income cash flows
- ❖ End value of the centre
- ❖ Refurbishment costs over the review period

In this case we will look at the analysis before tax and we will work on the basis of yearly adding of interest for discounting. We will use the yearly option in the “preference” window and this will assume that all of the cash flows are at the end of the year. Notice that if we wished to analyse the project on yearly intervals but wished to work off a base of adding interest at the end of each month we would have to adjust the discount rate up to allow for the interest on the interest. For example, for 10% with month adding of interest for cash flows on yearly interval we would need to use a discount rate of 10.47131%, for 12% monthly we would need 12.68250% and for 14% monthly the figure would be 14.93420%.

Appendix 13 shows a summary of the net income estimates to come from the centre. It is in the box on the top left hand side of the appendix. The starting expected income (in 1995) was estimated at \$18,500 (dealing in \$000's) – this is shown in the top of the 6 th column. In the 2 nd to the 4 th column is an estimate of the expected growth of the centre income. Built into

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this is a pattern of growth reflecting the economic cycle. The 3<sup>rd</sup> column carries the expected estimate and the 2<sup>nd</sup> and 4<sup>th</sup> columns carry the estimated variation (down and up) on this. Given the \$18,500 then it is assessed that the income could be down (in 1995) by 2.5 % (giving a value of \$18,038) or up by 3.5 % (giving a value of \$19,148). For 1996 the value of \$19,055 comes from increasing the \$18,500 by 3 %. The \$18,579 comes from the \$19,055 less 2.5 % and the \$19,722 from the \$19,055 plus 3.5 %, and so on. We will allow the income to have random variation year by year (ie we will not lock the amounts to each other). It was assessed that there was 2 chances in 10 the incomes could be below the central estimate, 5 chances in 10 it would be on the central estimate and 3 chances in 10 it would be above the central estimate.

The final income from the centre will trigger the estimate of the end value of the centre. Hence there will be an amount to amount relationship between the selected final years income and the end value of the centre. The other variable in the end value of the centre will be the yield base on which the value is based. Shown in the middle of the Appendix is a table calculating the end value. For example, the figure 363,3337 arises from the final low value of income (25,434) divided by .07 (the yield base of 7%). The 372,653 comes from 26,086 divided by .07 and so on. The figures making up the table then give a range of end value shown in the table. We need 2 values from the chance 2 column, 5 values from the chance 5 column and 3 values from the chance 3 column – these have been selected and shown in bold. These values will thus be coded to store in the data store location positions as shown. As we will lock this cash flow in

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amount to the final years income values, it will mean that if the final year income value of \$25,434 is selected, then the value taken for the end value will either be \$339,114 or \$299,218, similarly, if the final year income value of \$26,086 is selected, then the value taken for the end value will either be \$372,653, or , \$347,809, or, \$326,071, or , \$306,891, or, \$289,841, and so on.

Capital expenditure estimate on the retail centre are shown on the bottom of the spreadsheet. It is noticeable that the recycle time for major retail centre is decreasing and unless they are up graded their performance will decline. The expected capital expenditure reflect this and an allowance of plus or minus \$500 for each year has been allowed.

All of the above data was coded into the RiskAn program and it was analysed at three different discount rates – 10%, 12% and 14%. In this case the IRR and Cumulative Cash Flow results were ignored (IRR will not be sensible as there has been no input for opening value). These results were then pasted to a spreadsheet (in this case Excel) and the curves of value were generated. These are shown in Appendix 14.

These risk curves show the following. If the opportunity cost of using money for the interested party for whom the valuation has been made was 12% (payr) then this centre is certain to be worth \$202,000, it has 50 50 chance of being worth \$216,000 and has no chance of being worth \$238,000. If the owner was offered NPV @ 12% (payr) of \$125,000 then they should certainly consider the offer as this analysis says the offer is well above their valuation of the centre



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based on the expected future cash flows and their time-value-of-money rate of 12 % (payr).

If however the opportunity cost of using money for the party was 10% (payr) then the value risk curve is much more favourable. It is certain to be worth \$230,000, it has 50 50 chance of being worth \$246,000 and has no chance of being worth \$272,000. Notice if the party was interested to buy into the centre for an offer on NPV \$125,00 for 50% then it would make sense.

## **12.3 Use Of RiskAn Program For Valuation Of A Major Commercial Property**

We will now look at a valuation based on the NPV of expected future cash flows arising from the ownership of a major city property. The cash flows associated with the analysis will be :-

- ❖ Year by year expected net income cash flows
- ❖ End value of the centre
- ❖ Refurbishment costs over the review period

We will follow the same approach as that we used for the major retail centre.

- ❖ Spreadsheet for the initial analysis and NPV valuation based on one off estimates
- ❖ Analysis and understanding of the variations and relationships in the cash flows
- ❖ Code the data and input into RiskAn program
- ❖ Analyse the data and interpret the results

This property consisted of three properties adjoining each other and under the one ownership and management. There is one major tenant accounting for approximately half of the leasing. This major tenant is a government department and is contracted to take the space for some years ahead. There are other tenants with leases maturing at various times in the future. The projections of the future cash flows for the property were initially in terms of Net Income. The first step was to convert these into estimates of cash flow year by year. In this case the review and valuation was taken over 10 Years.

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This cash flow schedule became a matrix of 10 columns by 80 rows. Obviously too large to handle in any meaningful way for the analysis we will be doing. The schedule was then summarised into the following yearly cash flows:-

1. Outgoings
2. Major Tenant Contracted Incomes
3. Major Tenant Variable Income (not yet contracted)
4. Minor Tenants Contracted Incomes
5. Minor Tenants Variable Income (not yet contracted)
6. End Value of Building at year 10
7. Refurbishment and Leasing costs

The summary of these costs and incomes were then summarised in a spread sheet as shown in Appendix 15. It is this that will be used as the base for the RiskAn computer run to measure valuation of the properties in terms of NPV. Appendix 16 shows the data coding for the analysis of this problem.

Notice for the Outgoings (in the first 10 cash flows) variation has been allowed in the amounts and the times are fixed (ie 10 chances in 10). For the Incomes from the Major tenant the first 6 cash flows are those contracted (cash flows 11 to 16). For the Major tenant the variable income has been allowed to have considerable variation (cash flows 17 to 21). Notice for these the key year is the leasing in year 6 as the amount of income achieved in that year was made to govern the following 4 years of income (shown with the “A” in the relationships area of the data in put). Cash flows 22 to 31 are the fixed contracted income

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for the minor tenants and are shown as fixed in both time and amount. Cash flows 32 to 41 are the variable incomes from the Minor tenants. Some locking of the amounts has been allowed in groups for this income source. Cash flow 42 is the end value of the building and has been arrived at by a multiplier of the total net income assessed from the three sources of Major and Minor tenants and Outgoings. This led to the following matrix of possible net incomes.

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Cash Flow	Chances in 10									
	1	2	3	4	5	6	7	8	9	10
10	-4250	-4250	-4250	-4250	-4250	-4300	-4300	-4300	-4350	-4350
21	2500	2500	3000	3000	3500	3500	4000	4000	4500	4500
31	150	150	150	150	150	150	150	150	150	150
41	9250	9250	9500	9500	9500	9750	9750	9750	10000	10000
Total	7650	7650	8400	8400	8900	9100	9600	9600	10300	10300

These net incomes were then taken and used as a based for a “yield” based “valuation” as follows.

"YIELD" BASED VALUATION MATRIX OF PROPERTIES END VALUE DOLLARS MILLIONS										
Net income in \$ millions										
Base	7.65	7.65	8.40	8.40	8.90	9.10	9.60	9.60	10.30	10.30
5 %	153	153	168	168	178	182	192	192	206	206
6 %	128	128	140	140	148	152	160	160	172	172
7 %	109	109	120	120	127	130	137	137	147	147
8 %	96	96	105	105	111	114	120	120	129	129
9 %	85	85	93	93	99	101	107	107	114	114
10 %	77	77	84	84	89	91	96	96	103	103

If we ignore the values on the extreme ends of the ranges of Yield and restrict the end value range points to being from 100,000,000 to 160,000,000 with weighting to the lower end of the range. Cash flow 42 was input as having the chances as shown. As a test exercise, change the weights on these to be as follows :-

100,000	2/10
110,000	2/10
120,000	2/10
130,000	1/10
140,000	1/10
150,000	1/10

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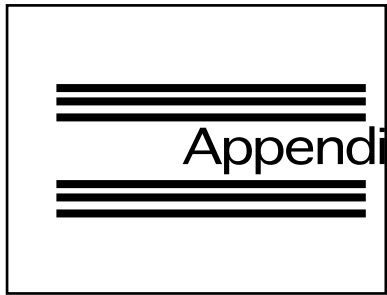
160,000

1/10

This will change the results slightly to make the curves move towards lower NPV valuations – this would be expected as more weight has been given to lower end values. Notice it was also related to the amount of cash flow 41 (the dominant income stream which triggers the major part of the net income). The final four cash flows are those associated with possible refurbishment and leasing costs at the peak period for releasing of the properties.

Appendix 17 shows the valuation risk curves at three different discount rates (payr). What this says is that if the interested party for whom the analysis had been made valued money for investment at 10% (payr), then the property is certain to be worth NPV \$62 (million), it has 50 50 chances of being worth NPV of \$77, and, it is not worth \$92. As the discount rate decreases the value of property rises, so at 8% (payr) the property is certain to be worth NPV \$72 (million), it has 50 50 chances of being worth NPV of \$91, and, it is not worth \$104.





### **Appendix**

This chapter contained all the items needed complete the manual. It contains sample data, spreadsheets and graphs.



# RiskAn User Guide

## Appendix 1. Data Preparation Form

[illegible]

## RiskAn User Guide

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## Appendix 2. Examples For Data Preparation

Prepare data sheets for the following cash flows.

### *EXAMPLE 1.*

Flow 1. Outflow of -130 , 3/10 : or -140 , 4/10 : or -150 , 3/10. At month 0 , 10/10. No relationships.

Flow 2. Outflow of -20 , 2/10 : or -25 , 2/10 : or -30 , 3/10 : or -35 , 3/10 . Occurring at Month 13 , 2/10 : M 14 , 2/10 : M 15 , 3/10 , M16 , 3/10. The amounts and the times of this cash flow are related to each other (not to the cash flow above).

Flow 3. Outflow of -35 , 2/10 : -40 , 6/10 : -45 , 2/10 . At Month 0 , 10/10. No relationships.

Flow 4. Inflow of 45 , 5/10 : 50 , 5/10. Occurring at Month 24 , 10/10 No relationships.

Flow 5. Inflow of 45 , 5/10 : 50 , 5/10. Occurring at Month 36 , 10/10. Amounts of cash flow 4. govern the amounts of cash flow 5.

Flow 6. Inflow of 100 , 10/10 and occurring at month 12 , 10/10. No relationships

Flow 7. Inflow of 50 , 10/10. In either M 60 , 5/10 : M 65 , 5/10. No relationships.

## RiskAn User Guide

Flow 8. Inflow of 30 , 10/10. In either M 72 , 5/10 : M 77 , 5/10. Times of flow 7. governing the times of flow 8.

## RiskAn User Guide

### *EXAMPLE 2.*

Code the following cash flows for after taxation. Allow tax at 50 cents in the dollar. Tax is all due to flow at month 21. Inflows are tax incurring and outflows are tax saving. This will mean the coding of the cash flow and then the tax implication coded as the following cash flow and locked in amount – ie two separate cash flows locked to each other in amount.

#### Incomes

1. (+56 , 3/10) (+60 , 7/10) at Month 10 , 10/10.  
(Cash flow 2. is tax)
2. Tax on Flow 1.
3. (+80 , 5/10) (+90 , 5/10) at Month 12 , 10/10.  
(Cash flow 4. is tax)
- 4 Tax on Flow 3.

#### Expenses

5. (-30 , 5/10) (-40 , 5/10) at Month 8 , 10/10.  
(Cash flow 6. is tax)
- 6 Tax on Flow 5.
7. (-60 , 3/10) (-70 , 7/10) at Month 7 , 10/10.  
(Cash flow 8. is tax)
- 8 Tax on Flow 7.

## RiskAn User Guide

### *EXAMPLE 3.*

Code the following cash flows for after taxation. Allow tax at 50 cents in the dollar. Tax timing is shown in the table below.

#### Incomes

Cash Flow 1. (+50 , 3/10) : (+60 , 4/10) : ( +70 , 3/10) at M 8 , 5/10 : M 9 , 5/10.

Cash Flow 2. Tax on cash flow 1.

Cash Flow 3. (+80 , 5/10) : (+100 , 5/10) at M 7 , 6/10 : M 9 , 4/10.

Cash Flow 4. Tax on cash flow 3.

#### Expenses

Cash Flow 5. (-30 , 1/10) : (-40 , 8/10) : (-50 , 1/10) at M 7 , 3/10 : M 8 , 5/10 , M 9 , 2/10.

Cash Flow 6. Tax on cash flow 5.

Cash Flow 7. (-20 , 5/10) : (-30 , 5/10) at M 8 , 7/10 : M 9 , 3/10.

Cash Flow 8. Tax on cash flow 7.

#### Tax Times Example 3.

For Year of months	0 to 8	9 to 20	21 to 32	33 to 44
Tax Paid Month	18	30	42	54

### *EXAMPLE 4.*

Code the following cash flows for after taxation. Allow tax at 50 cents in the dollar. Tax for the year ended Month 13 is all due in Month 23. Tax for the year ended 25 is all due in 35.

## RiskAn User Guide

### Expenses

Cash Flow 1. (-50 , 3/10) : (-60 , 4/10) : (-70 , 3/10) at M 12 , 3/10 : M 13 , 4/10 . M 14 , 3/10. If -50 is selected for amount then the cash flow must take place at month 12 , if -60 then month 13 and if -70 then month 14.

Cash Flow 2. Tax on cash flow 1.

### Incomes

Cash Flow 3. (+80 , 5/10) : (+90 , 4/10) : (+100 , 1/10) at M 18 , 5/10 : M 19 , 4/10 : M 20 , 1/10. If +80 is selected then to flow in month 18 , if +90 is selected then to flow in month 19 and if +100 is selected then to flow in month 20.

Cash Flow 4. Tax on cash flow 3.

Tax Times Example 4.

For Year of months	2 to 13	14 to 25	26 to 37	38 to 49
Tax Paid Month	23	35	47	59

### *EXAMPLE 5.*

Code the following cash flows for after taxation. Allow tax at 50 cents in the dollar. Tax for the year is as per the following table :-

For Year of months	0 - 11	12 -23	24 - 35	36 - 47	48 - 59	60 - 71
Tax is all due month	20	32	44	56	68	80

## RiskAn User Guide

1. Buy an item of capital equipment and pay  $(-120, 5/10) : (-150, 5/10)$  at  $M 0, 10/10$ .
2. Claim a Tax saving from investment allowance at rate of 40% of initial value. This will lead to a tax saving of 20% of original cost.
- 3.-5. Claim a tax saving from depreciation claim based on straight line depreciation at  $33 \frac{1}{3} \%$  pa. This will lead to 3 tax savings of  $1/6$  of original cost – they will be spaced at yearly intervals.
6. Sell equipment at  $(+30, 5/10) : (+40, 5/10)$ . At  $M 36 10/10$ .
7. Account for the taxation implication of sale price compared to book value at time of sale.



## RiskAn User Guide

### *EXAMPLE 6.*

Code the following cash flows for after taxation. Allow tax at 50 cents in the dollar. Tax for is as per the following table :-

For Year of months	0 - 11	12 -23	24 - 35	36 - 47	48 - 59	60 - 71
Tax is all due month	20	32	44	56	68	80

- 1.-6. Capital item for which you can claim a tax saving based on 20 % straight line depreciation over 5 years. Purchase price (-100 , 3/10 ) : (-120 , 4/10 ) : (-140 , 3/10). At Month 0 , 10/10. This will lead to the coding of one cash flow for the purchase of the item and then 5 following cash flows for the 5 years of tax savings. The item is scrapped after 5 years for no residual value.
- 7.-8. Costs which are fully tax deductible of (-40 , 3/10 ) : (-50 , 4/10 ) : ( -60 , 2/10 ) : (-70 , 1/10 ). At ( M 11 , 5/10 ) : ( M 12 , 5/10).
9. Costs which are not deductible of (-100 , 5/10 ) : (-120 , 5/10 ). At (M 18 , 6/10 ) : (M 19 , 4/10 ).
- 10.-11. Incomes which are tax incurring of (+200 , 5/10 ) : (+220 , 3/10 ) : (+240 , 1/10 ) : (+260 , 1/10 ). At ( M 23 , 5/10 ) : ( M 24 , 5/10 ).
- 12.-13. Incomes which are tax incurring of (+250 , 3/10 ) : (+260 , 4/10 ) (+270 , 3/10 ). At ( M 8 , 4/10 ) : ( M 9 , 6/10 ).

## **Appendix 3. Example For Coding And Running On RiskAn**

### **SHARE PORTFOLIO**

Prepare Computer Data Sheets for the following proposed share portfolio.

Invent an appropriate name. Used current date. Allow for 200 Loops. Prepare an NPV risk curve at a discount rate of 12% with Monthly Rest adding of interest.

## RiskAn User Guide

### *Share 1.*

It is assessed that over the 24 months period the index that is applicable to this share can vary from -5% to +10% (not PA but for the 2 years). It is assessed that the following pattern for the index will apply (-5% 1 chance in 10, 0% 2 chances in 10, +5 % 4 chances in 10, +10 % 3 chances in 10).

This share is expected to do 5% better than the index over the period of analysis

Buy 1000 shares,

Net Buy Price per share (-10.20 , 3/10) : (-10.30 , 4/10) : (-10.40 , 3/10).

Buy Time Month 0 10/10.

Dividend 1. per share (0.30 , 5/10) : (0.32 , 3/10) : (0.34 , 2/10). Month 4 . 10/10.

Dividend 2. per share (0.32 , 5/10) : (0.34 , 3/10) : (0.36 , 2/10). Month 10. 10/10. Related in amount to previous dividend.

Dividend 3. per share (0.34 , 5/10) : (0.36 , 3/10) : (0.38 , 2/10). Month 16 . 10/10. Related in amount to previous dividend.

Sale Price per share (10.30, 1/10):(10.82, 2/10):(11.33, 4/10):(11.85, 3/10). Month 18 10/10. Sale price independent of previous dividend.

The reasoning for the sale price of the share was as follows. Based on the expectation for the index, then, as the share is expected to do 5% better than the index, the share is expected to have a sales price of (0% 1 chance in 10, +5% 2 chances in 10, +10 % 4 chances in 10, +15 % 3 chances in 10). With an average buy price of -10.30 this translates into the figures shown.

## RiskAn User Guide

### *Share 2*

It is assessed that over the 24 months period the index that is applicable to this share can vary from -10% to +10% (not PA but for the 2 years). It is assessed that the following pattern for the index will apply (-10 % 1 chances in 10, -5% 2 chances in 10, 0% 2 chances in 10, +5 % 3 chances in 10, +10 % 2 chances in 10).

This share is expected to do no different to the index over the period of analysis

Buy 10000 shares,

Net Buy Price per share (-1.20 , 4/10) : (-1.30 , 4/10) : (-1.40 , 2/10).

Buy Time Month 2 10/10.

Dividend 1. (0.05 , 3/10) : (0.06 , 5/10) : (0.07 , 2/10). Month 6 , 10/10.

Dividend 2. (0.05 , 3/10) : (0.06 , 5/10) : (0.07 , 2/10). Month 18, 10/10. Related in amount to previous dividend.

Sale Price (1.17 , 1 chances in 10, 1.24 , 2 chances in 10, 1.30 , 2 chances in 10, 1.37 , 3 chances in 10, 1.43 , 2 chances in 10). Month 18 10/10.

Sale price independent of previous dividend.

## RiskAn User Guide

### *Share 3.*

It is assessed that over the 24 months period the index that is applicable to this share can vary from 0% to +10% (not PA but for the 2 years). It is assessed that the following pattern for the index will apply (0% 4 chances in 10, +5 % 4 chances in 10, +10 % 2 chances in 10). This share is expected to do no different to the index over the period of analysis

Buy 5000 shares,

Net Buy Price per share (-6.20, 3/10) : (-6.50 , 4/10) : (-6.80 , 3/10).

Buy Time Month 1 10/10.

Dividend 1. (0.20 , 4/10) : (0.22 , 4/10) : (0.24 , 2/10). Month 5 . 10/10.

Dividend 2. (0.20 , 4/10) : (0.22 , 4/10) : (0.24 , 2/10). Month 17 . 10/10. Related in amount to previous dividend.

Sale Price (6.50 , 4/10) : (6.83 , 4/10) : (7.15 , 2/10). At month 18 10/10.

Sale price independent on previous dividend.

## RiskAn User Guide

### *Share 4.*

It is assessed that over the 24 months period the index that is applicable to this share can vary from -5% to +10% (not PA but for the 2 years). It is assessed that the following pattern for the index will apply (-5% 1 chance in 10, 0% 2 chances in 10, +5 % 4 chances in 10, +10 % 3 chances in 10).

This share is expected to do 10% better than the index over the period of analysis

Buy 20000 shares,

Net Buy Price per share (-1.80 , 3/10) : (-1.85 , 4/10) : (-1.90 , 3/10).

Buy Time Month 2 10/10.

Dividend 1. (0.04 , 4/10) : (0.05 , 3/10) : (0.06 , 3/10). Month 5 . 10/10.

Dividend 2. (0.05 , 4/10) : (0.06 , 3/10) : (0.07 , 3/10). Month 11 . 10/10. Related in amount to previous dividend.

Dividend 3. (0.06 , 4/10) : (0.07 , 3/10) : (0.08 , 3/10). Month 17 . 10/10. Related in amount to previous dividend.

Sale Price per share (1.76, 1/10):(1.85, 2/10):(1.94, 4/10):(2.04, 3/10). Month 18 10/10. Sale price independent of previous dividend.

## Appendix 4. Data Ready For Computer Input For Share Portfolio Analysis

2.12.1995      Share Portfolio 1.  
Units \$1      Discount Rate 12.0000%      Number of Loops 200

FLOW No	AMOUNT	PROB	TIME	PROB	[N]	[A]	[T]	[AT]	[X]
[AX]									
Cash flow No:1									
	-10200.00	3	0	10	N				
	-10300.00	4							
	-10400.00	3							
Cash flow No:2									
	300.00	5	4	10	N				
	320.00	3							
	340.00	2							
Cash flow No:3									
	320.00	5	10	10	A				
	340.00	3							
	360.00	2							
Cash flow No:4									
	340.00	5	16	10	A				
	360.00	3							
	380.00	2							
Cash flow No:5									
	10300.00	1	18	10	N				
	10820.00	2							
	11330.00	4							
	11850.00	3							
Cash flow No:6									
	-12000.00	4	2	10	N				
	-13000.00	4							
	-14000.00	2							
Cash flow No:7									
	500.00	3	6	10	N				
	600.00	5							
	700.00	2							
Cash flow No:8									
	500.00	3	18	10	A				
	600.00	5							
	700.00	2							
Cash flow No:9									
	11700.00	1	18	10	N				
	12400.00	2							
	13000.00	2							
	13700.00	3							
	14300.00	2							
Cash flow No:10									

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-31000.00	3	1	10	N
-32500.00	4			
-34000.00	3			
Cash flow No: 11				
1000.00	4	5	10	N
1100.00	4			
1200.00	2			
Cash flow No: 12				
1000.00	4	17	10	A
1100.00	4			
1200.00	2			
Cash flow No: 13				
32500.00	4	18	10	N
34150.00	4			
35750.00	2			
Cash flow No: 14				
-36000.00	3	2	10	N
-37000.00	4			
-38000.00	3			
Cash flow No: 15				
800.00	4	5	10	N
1000.00	3			
1200.00	3			
Cash flow No: 16				
1000.00	4	11	10	A
1200.00	3			
1400.00	3			
Cash flow No: 17				
1200.00	4	17	10	A
1400.00	3			
1600.00	3			
Cash flow No: 18				
35200.00	1	18	10	N
37000.00	2			
38800.00	4			
40800.00	3			



## Appendix 5. Results Of Computer Run On Share Portfolio 1

### ANALYSIS REPORT

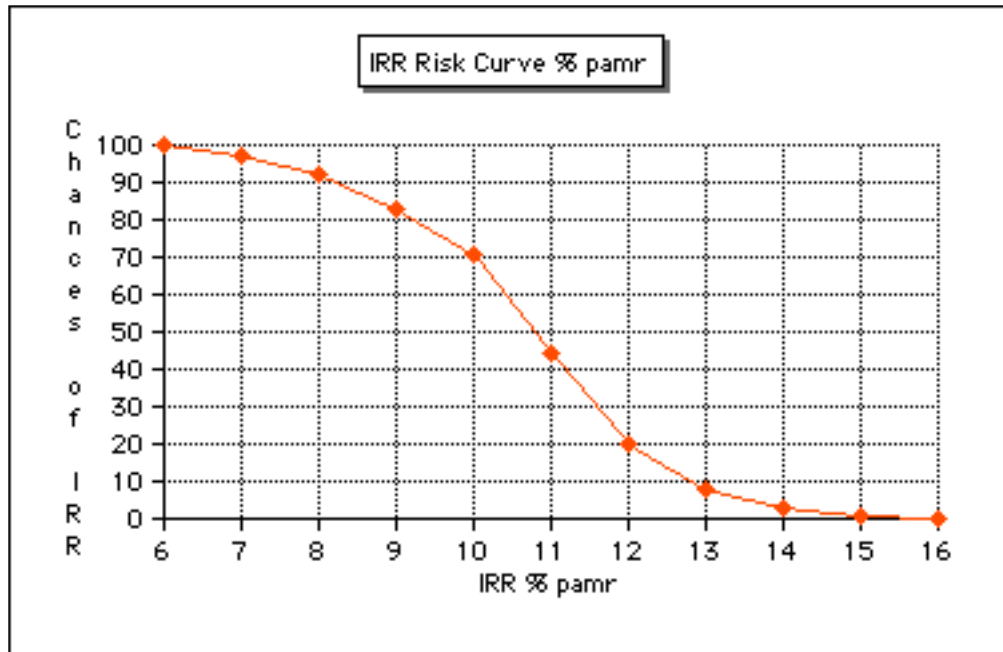
Date :	18/05/94
Name :	SHARES
Units:	1
Time :	Months
Discount Rate :	15.00%
Number of	200
Loops :	

### IRR REPORT

#### PROBABILITY OF GETTING AN IRR OR BETTER

IRR (Percent)	PROBABILITY (Percent)
6	100
7	97
8	92
9	83
10	71
11	44
12	20
13	8
14	3
15	1
16	0

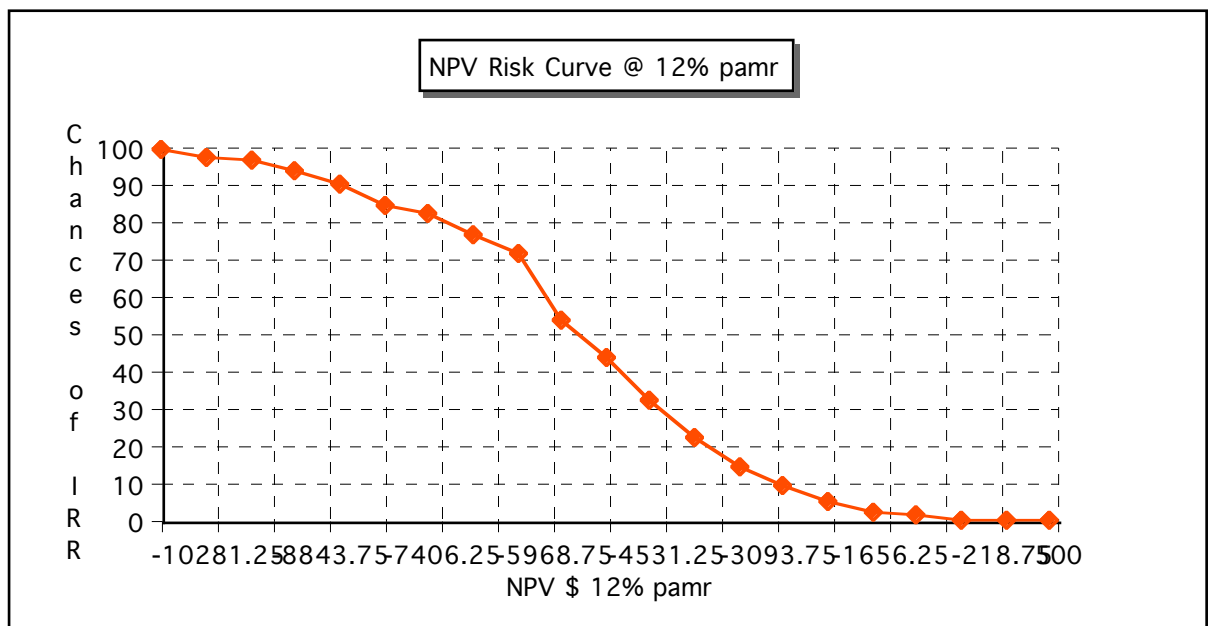
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## RESIDUAL N.P.V. REPORT VARIATION IN RESIDUAL N.P.V. M.R.

NPV or better	Chance
\$	%
(\$11,018)	100
(\$10,448)	98
(\$9,879)	97
(\$9,310)	94
(\$8,740)	91
(\$8,171)	85
(\$7,602)	83
(\$7,032)	77
(\$6,463)	72
(\$5,894)	54
(\$5,324)	44
(\$4,755)	33
(\$4,186)	23
(\$3,617)	15
(\$3,047)	10
(\$2,478)	6
(\$1,909)	3
(\$1,339)	2
(\$770)	1
(\$201)	1
\$369	1



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## MONTHLY CASH POSITION REPORT

Month No.	MEAN FLOW FOR MONTH	CUMULATIVE MEAN TO MONTH END	'WORST' CUMULATIVE TO MONTH END	'BEST' CUMULATIVE TO MONTH END
0	-10319.5	-10319.5	-10400	-10200
1	-32635	-42954	-44400	-41200
2	-50105	-93059	-96400	-89200
3	0	-93059	-96400	-89200
4	316	-92743	-96100	-88880
5	2079	-90664	-94100	-86480
6	611	-90052	-93600	-85880
7	0	-90052	-93600	-85880
8	0	-90052	-93600	-85880
9	0	-90052	-93600	-85880
10	336	-89716	-93280	-85540
11	1195	-88521	-92140	-84140
12	0	-88521	-92140	-84140
13	0	-88521	-92140	-84140
14	0	-88521	-92140	-84140
15	0	-88521	-92140	-84140
16	356	-88165	-91780	-83780
17	2479	-85686	-89480	-80980
18	99129	13443	7280	20120

## Appendix 6. Residential Medium Density Development

APPENDIX 6. RESIDENTIAL MEDIUM DENSITY DEVELOPMENT											
RESULTS NPV pamr											
@	0%	207									
@	5%	150									
@	10%	99									
@	15%	51									
@	20%	8									
@	25%	-31									
MONT H NO.	LAND PURC H- ASE	STAMP DUTY AND LEGAL	COUN FEES BA & DA	SITE PRE- PAR- ATIO N	DESIG N ARCH ENGIN	BUIL D & L/SCP	MAR- KET- ING	RATE AND TAX	NET SALE INC- OME	NET CASH FLOW	CUM. CASH FLOW
0	-36									-36	-36
1					-10					-10	-46
2	-324	-13	-5							-342	-388
3								-4		-4	-392
4			-23							-23	-415
5				-7				-4		-11	-426
6						-80				-80	-506
7						-100				-100	-606
8						-100		-3		-103	-709
9						-100				-100	-809
10						-100				-100	-909
11						-30				-30	-939
12						-10	-5			-15	-954
13						-15	-5			-20	-974
14						-5	-3			-8	-982
15							-3	-4	400	393	-589
16									200	200	-389
17								-4	200	196	-193
18									200	200	7
19									200	200	207
20										0	207
21										0	207
22										0	207
SUM	-360	-13	-28	-7	-10	-540	-16	-19	1200	207	

## Appendix 7. Data For Residential Medium Density Analysis

07/02/1993	Units \$1000	Discount Rate 25.0000%			Number of Loops 200			
FLOW No	AMOUNT	PROB	TIME	(Months)	PROB	[N]	[A]	[T]
[AT] [X] [AX]								
Cash flow No:1 Deposit on Land								
-36.00	10	0	10		N			
Cash flow No:2 Settlement of Land								
-324.00	10	2	5		5	N		
		3						
Cash flow No:3 Stamp Duty and Legal								
-13.00	10	2	5			T		
		3	5					
Cash flow No:4 Council fees								
-5.00	5	2	5			T		
-6.00	5	3	5					
Cash flow No:5 Council fees								
-23.00	3	4	5			T		
-25.00	4	5	5					
-27.00	3							
Cash flow No:6 Site preparation								
-7.00	3	5	5			T		
-8.00	3	6	5					
-9.00	3							
-10.00	1							
Cash flow No:7 Design and Engineering								
-9.00	2	1	5		N			
-10.00	2	2	5					
-11.00	2							
-12.00	2							
-13.00	2							
Cash flow No:8 Build and Landscape								
-76.00	3	6	4		N			
-80.00	4	7	3					
-84.00	3	8	3					
Cash flow No:9 Build and Landscape								
-95.00	3	7	4			AT		
-100.00	4	8	3					
-105.00	3	9	3					
Cash flow No:10 Build and Landscape								
-95.00	3	8	4			AT		
-100.00	4	9	3					
-105.00	3	10	3					
Cash flow No:11 Build and Landscape								
-95.00	3	9	4			AT		
-100.00	4	10	3					
-105.00	3	11	3					

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Cash flow No:12 Build and Landscape						
-95.00	3	10	4			AT
-100.00	4		11	3		
-105.00	3		12	3		
Cash flow No:13 Build and Landscape						
-28.50	3	11	4			AT
-30.00	4	12	3			
-31.50	3	13	3			
Cash flow No:14 Build and Landscape						
-10.00	4	12	4			T
-12.00	3	13	3			
-14.00	3	14	3			
Cash flow No:15 Build and Landscape						
-15.00	4	13	4			AT
-17.00	3	14	3			
-19.00	3	15	3			
Cash flow No:16 Build and Landscape						
-5.00	4	14	4			AT
-7.00	3	15	3			
-9.00	3	16	3			
Cash flow No:17 Marketing Costs						
-5.00	10	12	4			T
		13	3			
		14	3			
Cash flow No:18 Marketing Costs						
-5.00	10	13	4			T
		14	3			
		15	3			
Cash flow No:19 Marketing Costs						
-3.00	10	14	4			T
		15	3			
		16	3			
Cash flow No:20 Marketing Costs						
-3.00	10	15	4			T
		16	3			
		17	3			
Cash flow No:21 Net Sales Income						
380.00	2	15	4			T
390.00	2	16	3			
400.00	2	17	3			
410.00	2					
420.00	2					
Cash flow No:22 Net Sales Income						
195.00	3	16	4			T
200.00	4	17	3			
205.00	3	18	3			
Cash flow No:23 Net Sales Income						
190.00	3	17	4			T
200.00	4	18	3			
210.00	3	19	3			

## RiskAn User Guide

Cash flow No:24 Net Sales Income					
190.00	3	18	4		T
200.00	4	19	3		
210.00	3	20	3		
Cash flow No:25 Net Sales Income					
190.00	3	19	4		T
200.00	4	20	3		
210.00	3	21	3		
Cash flow No:26 Rates and Taxes					
-4.00	10	3	10	N	
Cash flow No:27 Rates and Taxes					
-4.00	10	5	10	N	
Cash flow No:28 Rates and Taxes					
-3.00	10	8	10	N	
Cash flow No:29 Rates and Taxes					
-4.00	10	15	10	N	
Cash flow No:30 Rates and Taxes					
-4.00	10	17	10	N	

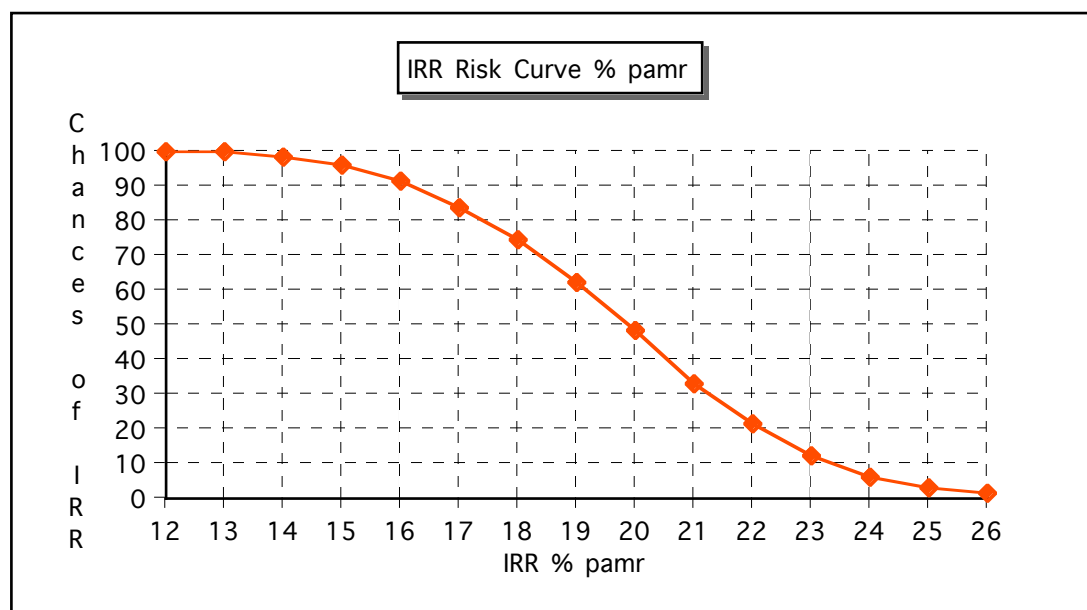


## Appendix 8. Results Of Computer Run On Medium Density Housing

Date :	18/05/94
Name :	RESIDENTIAL
	M.D.
Units:	000's
Time :	Months
Discount Rate :	25.00%
Number of Loops :	400

### IRR REPORT

IRR %	PROBABILITY %
12.0	100.0
13.0	99.8
14.0	98.8
15.0	96.0
16.0	91.3
17.0	83.5
18.0	74.5
19.0	62.5
20.0	48.8
21.0	32.8
22.0	21.3
23.0	12.3
24.0	5.8
25.0	2.8
26.0	1.3

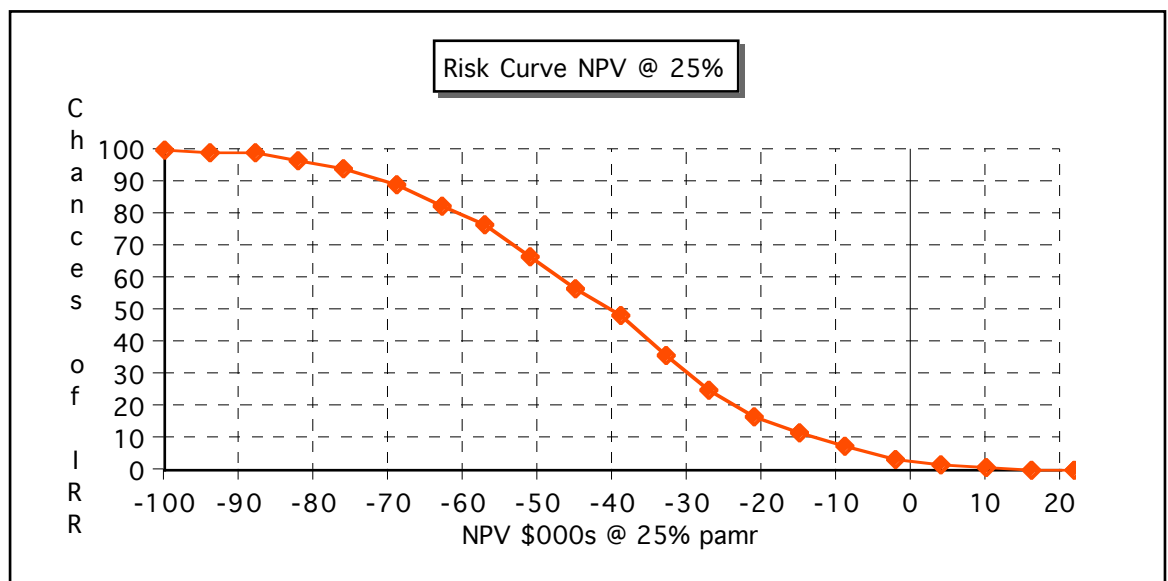


# RiskAn User Guide

## RESIDUAL N.P.V. REPORT

### VARIATION IN RESIDUAL N.P.V. M.R.

Probability of getting \$000's	or better is %
-100	100.0
-94	99.3
-88	99.0
-82	96.5
-76	94.3
-69	89.3
-63	82.8
-57	76.5
-51	67.0
-45	56.8
-39	48.0
-33	35.5
-27	25.0
-21	16.8
-15	11.8
-9	7.3
-2	3.5
4	2.0
10	0.8
16	0.3
22	0.3



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## MONTHLY CASH POSITION REPORT

Month No.	MEAN FLOW FOR MONTH	CUMULATI VE MEAN TO MONTH END	'WORST' CUMULATI VE TO MONTH END	'BEST' CUMULATI VE TO MONTH END
0	-36	-36	-36	-36
1	-4	-40	-49	-36
2	-164	-205	-392	-45
3	-189	-394	-396	-391
4	-12	-405	-423	-391
5	-21	-427	-437	-418
6	-32	-459	-520	-426
7	-58	-517	-625	-426
8	-96	-613	-733	-505
9	-100	-713	-838	-600
10	-100	-814	-943	-695
11	-76	-890	-975	-790
12	-51	-941	-992	-885
13	-23	-965	-1016	-914
14	-16	-980	-1028	-929
15	124	-857	-1031	-552
16	181	-675	-1035	-347
17	269	-406	-653	-151
18	201	-205	-455	60
19	202	-3	-265	270
20	131	128	-75	270
21	73	201	126	270

## Appendix 9. Property Investment Spreadsheet

PROPERTY INVESTMENT SPREAD SHEET										
Disc. Rate % pamr	Net	All in \$'000's								
	Present									
	Value									
Month No.r	Propert y Buy  and Sell	Stamp  Duty  Legal Buy  & Sell	Lease  Prom- tion Costs	Lease  Comm- - ission	Refurb  Costs	Fixed  Incom e Includ. Out  Going s	Variab  - Incom e Includ. Out  Going s	Out  Going s	Net  Cash  Flow for Month	Cum.  Cash  Flow  Month End
0	-200								-200	-200
1									0	-200
2	-1800	-20				18		-4	-1806	-2006
3					-50	18		-4	-36	-2042
4					-100	18		-4	-86	-2128
5					-150	18		-4	-136	-2264
6					-100	18		-4	-86	-2350
7					-100	18		-4	-86	-2436
8			-10			18		-4	4	-2432
9			-15			18	5	-4	4	-2428
10			-10	-20		18	5	-4	-11	-2439
11			-5	-20		18	5	-4	-6	-2445
12						15	8	-4	19	-2426
13						15	8	-6	17	-2409
14						15	8	-6	17	-2392
15						15	8	-6	17	-2375
16						15	8	-6	17	-2358
17						15	8	-6	17	-2341
18						15	8	-6	17	-2324
19						15	8	-6	17	-2307
20						15	8	-6	17	-2290
21						15	8	-6	17	-2273
22						15	8	-6	17	-2256
23						15	8	-6	17	-2239
24						15	10	-6	19	-2220

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25						15	10	-6	19	-2201
26	2800	-15				15	10	-6	2804	603
Totals	800	-35	-40	-40	-500	405	141	-128	603	

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## Appendix 10. Data For Property Investment Analysis

07/05/1993	Units \$1000	Discount Rate 12.0000%	Number of Loops 200
FLOW No	AMOUNT (\$1	) PROB	TIME (Months) PROB
	[N] [A] [T] [AT] [X] [AX]		
Cash flow No:1	(Deposit)		
-200.00	10	0	10 N
Cash flow No:2	(Settle Purchase)		
-1800.00	10	2	5 N
		3	5
Cash flow No:3	(Legal and Stamp Duty)		
-20.00	10	2	5 T
		3	5
Cash flow No:4	(Refurb. costs 1.)		
-45.00	3	3	5 N
-50.00	4	4	5
-55.00	3		
Cash flow No:5	(Refurb. costs 2.)		
-95.00	3	4	5 AT
-100.00	4	5	5
-105.00	3		
Cash flow No:6	(Refurb. costs 3.)		
-140.00	3	5	5 AT
-150.00	4	6	5
-160.00	3		
Cash flow No:7	(Refurb. costs 4.)		
-90.00	3	6	5 AT
-100.00	4	7	5
-110.00	3		
Cash flow No:8	(Refurb. costs 5.)		
-90.00	3	7	5 AT
-100.00	4	8	5
-110.00	3		
Cash flow No:9	(Leasing Costs 1.)		
-10.00	3	8	5 AT
-12.00	4	9	5
-15.00	3		
Cash flow No:10	(Leasing Costs 2.)		
-15.00	3	9	5 AT
-17.00	4	10	5
-20.00	3		
Cash flow No:11	(Leasing Costs 3.)		
-10.00	3	10	5 AT
-12.00	4	11	5
-15.00	3		
Cash flow No:12	(Leasing Costs 4.)		
-5.00	3	11	5 AT

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	-7.00	4	12	5	
	-15.00	3			
Cash flow No:13	(Leasing Commission 1.)				
	-20.00	5	10	5	T
	-25.00	5	11	5	
Cash flow No:14	(Leasing Commission 2.)				
	-20.00	5	11	5	T
	-25.00	5	12	5	
Cash flow No:15	(Fixed Income Month 2.)				
	18.00	10	2	10	N
Cash flow No:16	(Fixed Income Month 3.)				
	18.00	10	3	10	N
Cash flow No:17	(Fixed Income Month 4.)				
	18.00	10	4	10	N
Cash flow No:18	(Fixed Income Month 5.)				
	18.00	10	5	10	N
Cash flow No:19	(Fixed Income Month 6.)				
	18.00	10	6	10	N
Cash flow No:20	(Fixed Income Month 7.)				
	18.00	10	7	10	N
Cash flow No:21	(Fixed Income Month 8.)				
	18.00	10	8	10	N
Cash flow No:22	(Fixed Income Month 9.)				
	18.00	10	9	10	N
Cash flow No:23	(Fixed Income Month 10.)				
	18.00	10	10	10	N
Cash flow No:24	(Fixed Income Month 11.)				
	18.00	10	11	10	N
Cash flow No:25	(Fixed Income Month 12.)				
	18.00	10	12	10	N
Cash flow No:26	(Fixed Income Month 13.)				
	15.00	10	13	10	N
Cash flow No:27	(Fixed Income Month 14.)				
	15.00	10	14	10	N
Cash flow No:28	(Fixed Income Month 15.)				
	15.00	10	15	10	N
Cash flow No:29	(Fixed Income Month 16.)				
	15.00	10	16	10	N
Cash flow No:30	(Fixed Income Month 17.)				
	15.00	10	17	10	N
Cash flow No:31	(Fixed Income Month 18.)				
	15.00	10	18	10	N
Cash flow No:32	(Fixed Income Month 19.)				
	15.00	10	19	10	N
Cash flow No:33	(Fixed Income Month 20.)				
	15.00	10	20	10	N
Cash flow No:34	(Fixed Income Month 21.)				
	15.00	10	21	10	N
Cash flow No:35	(Fixed Income Month 22.)				
	15.00	10	22	10	N

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Cash flow No:36	(Fixed Income Month 23.)				
15.00	10	23	10	N	
Cash flow No:37	(Fixed Income Month 24.)				
15.00	10	24	10	N	
Cash flow No:38	(Fixed Income Month 25.)				
15.00	10	25	10	N	
Cash flow No:39	(Fixed Income Month 26.)				
15.00	10	26	10	N	
Cash flow No:40	(Variable Income Month 9.)				
5.00	4	9	10	N	
5.50	3				
6.00	3				
Cash flow No:41	(Variable Income Month 10.)				
5.00	4	10	10	A	
5.50	3				
6.00	3				
Cash flow No:42	(Variable Income Month 11.)				
5.00	4	11	10	A	
5.50	3				
6.00	3				
Cash flow No:43	(Variable Income Month 12.)				
7.00	4	12	10	A	
8.00	3				
8.50	3				
Cash flow No:44	(Variable Income Month 13.)				
7.00	4	13	10	A	
8.00	3				
8.50	3				
Cash flow No:45	(Variable Income Month 14.)				
7.00	4	14	10	A	
8.00	3				
8.50	3				
Cash flow No:46	(Variable Income Month 15.)				
7.00	4	15	10	A	
8.00	3				
8.50	3				
Cash flow No:47	(Variable Income Month 16.)				
7.00	4	16	10	A	
8.00	3				
8.50	3				
Cash flow No:48	(Variable Income Month 17.)				
7.00	4	17	10	A	
8.00	3				
8.50	3				
Cash flow No:49	(Variable Income Month 18.)				
7.00	4	18	10	A	
8.00	3				
8.50	3				
Cash flow No:50	(Variable Income Month 19.)				
7.00	4	19	10	A	



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	8.00	3		
	8.50	3		
Cash flow No:51	(Variable Income Month 20.)			
	7.00	4	20	10 A
	8.00	3		
	8.50	3		
Cash flow No:52	(Variable Income Month 21.)			
	7.00	4	21	10 A
	8.00	3		
	8.50	3		
Cash flow No:53	(Variable Income Month 22.)			
	7.00	4	22	10 A
	8.00	3		
	8.50	3		
Cash flow No:54	(Variable Income Month 23.)			
	7.00	4	23	10 A
	8.00	3		
	8.50	3		
Cash flow No:55	(Variable Income Month 24.)			
	9.00	4	24	10 A
	10.00	3		
	11.00	3		
Cash flow No:56	(Variable Income Month 25.)			
	9.00	4	25	10 A
	10.00	3		
	11.00	3		
Cash flow No:57	(Variable Income Month 26.)			
	9.00	4	26	10 A
	10.00	3		
	11.00	3		
Cash flow No:58	(Out goings Month 2.)			
	-4.00	10	2	10 N
Cash flow No:59	(Out goings Month 3.)			
	-4.00	10	3	10 N
Cash flow No:60	(Out goings Month 4.)			
	-4.00	10	4	10 N
Cash flow No:61	(Out goings Month 5.)			
	-4.00	10	5	10 N
Cash flow No:62	(Out goings Month 6.)			
	-4.00	10	6	10 N
Cash flow No:63	(Out goings Month 7.)			
	-4.00	10	7	10 N
Cash flow No:64	(Out goings Month 8.)			
	-4.00	10	8	10 N
Cash flow No:65	(Out goings Month 9.)			
	-4.00	10	9	10 N
Cash flow No:66	(Out goings Month 10.)			
	-4.00	10	10	10 N
Cash flow No:67	(Out goings Month 11.)			
	-4.00	10	11	10 N

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Cash flow No:68	(Out goings Month 12.)				
-4.00	10	12	10	N	
Cash flow No:69	(Out goings Month 13.)				
-5.00	4	13	10	N	
-6.00	3				
-7.00	3				
Cash flow No:70	(Out goings Month 14.)				
-5.00	4	14	10	A	
-6.00	3				
-7.00	3				
Cash flow No:71	(Out goings Month 15.)				
-5.00	4	15	10	A	
-6.00	3				
-7.00	3				
Cash flow No:72	(Out goings Month 16.)				
-5.00	4	16	10	A	
-6.00	3				
-7.00	3				
Cash flow No:73	(Out goings Month 17.)				
-5.00	4	17	10	A	
-6.00	3				
-7.00	3				
Cash flow No:74	(Out goings Month 18.)				
-5.00	4	18	10	A	
-6.00	3				
-7.00	3				
Cash flow No:75	(Out goings Month 19.)				
-5.00	4	19	10	A	
-6.00	3				
-7.00	3				
Cash flow No:76	(Out goings Month 20.)				
-5.00	4	20	10	A	
-6.00	3				
-7.00	3				
Cash flow No:77	(Out goings Month 21.)				
-5.00	4	21	10	A	
-6.00	3				
-7.00	3				
Cash flow No:78	(Out goings Month 22.)				
-5.00	4	22	10	A	
-6.00	3				
-7.00	3				
Cash flow No:79	(Out goings Month 23.)				
-5.00	4	23	10	A	
-6.00	3				
-7.00	3				
Cash flow No:80	(Out goings Month 24.)				
-5.00	4	24	10	A	
-6.00	3				
-7.00	3				

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Cash flow No: 81	(Out goings Month 25.)				
-5.00	4	25	10	A	
-6.00	3				
-7.00	3				
Cash flow No: 82	(Out goings Month 26.)				
-5.00	4	26	10	A	
-6.00	3				
-7.00	3				
Cash flow No: 83	(Net Sales Income.)				
2800.00	2	26	5	N	
2900.00	2	27	5		
3000.00	2				
3100.00	2				
3200.00	2				
Cash flow No: 84	(Legal Costs on Sale.)				
-20.00	10	26	5		T
		27	5.		

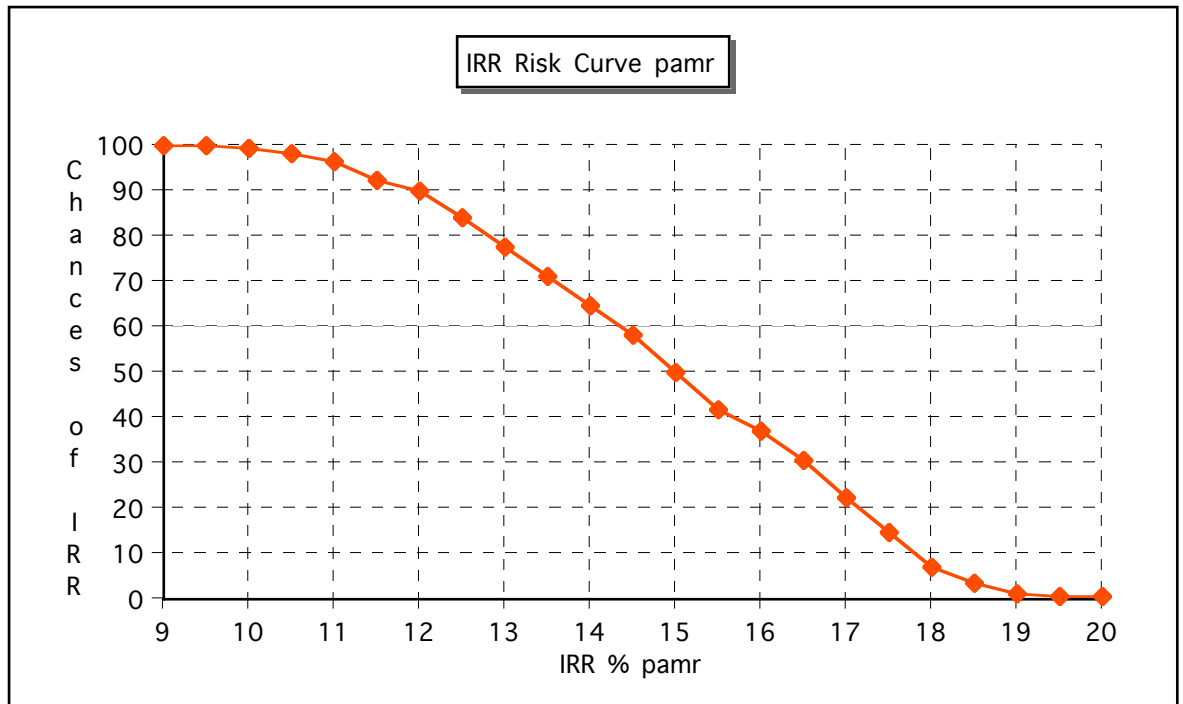
## Appendix 11. Results Of Risk Analysis On Appendix 10.

Date :	18/05/94
Name :	PROPERTY INVESTMENT
Units:	000's
Time :	Months
Discount Rate :	12.00%
Number of Loops	400

### IRR REPORT

IRR %	PROBABILITY %
9.0	100.0
9.5	99.8
10.0	99.5
10.5	98.3
11.0	96.5
11.5	92.5
12.0	89.8
12.5	84.0
13.0	77.5
13.5	71.3
14.0	64.5
14.5	58.5
15.0	49.8
15.5	41.8
16.0	37.0
16.5	30.8
17.0	22.3
17.5	14.5
18.0	7.3
18.5	3.8
19.0	1.3
19.5	0.3
20.0	0.3

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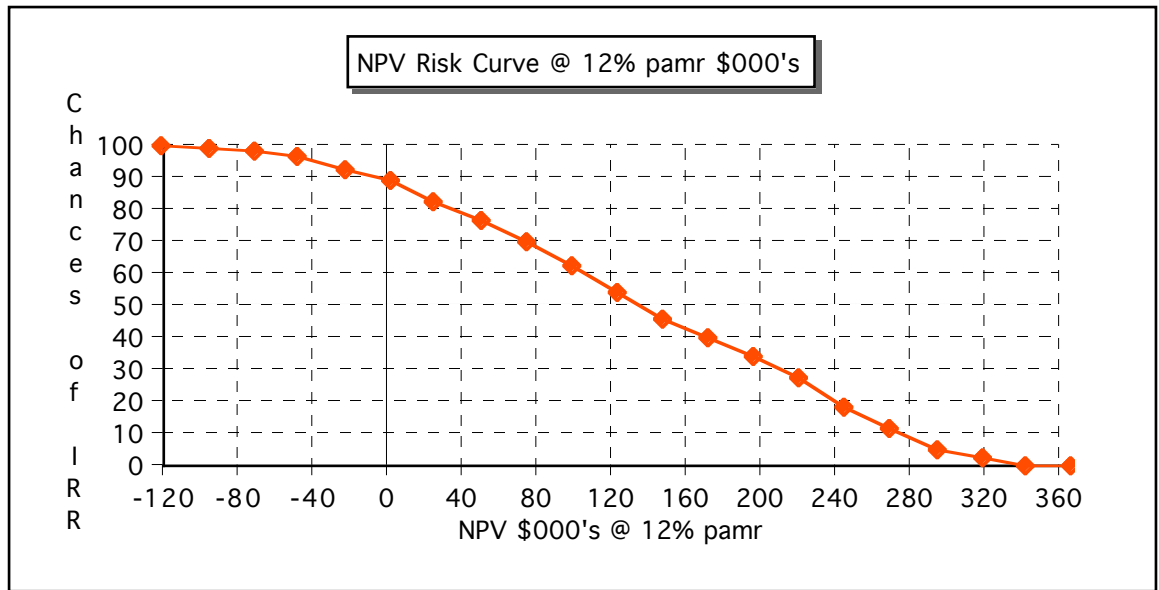


## RESIDUAL N.P.V. REPORT

### VARIATION IN RESIDUAL N.P.V. M.R.

NPV \$ 000's	PROBABILITY %
-121	100.0
-96	99.5
-72	98.3
-48	96.8
-23	92.5
1	89.3
25	82.3
50	76.3
74	70.0
99	62.5
123	54.0
147	45.5
172	39.8
196	33.8
220	27.8
245	18.5
269	11.8
294	5.3
318	2.5
342	0.3
367	0.3

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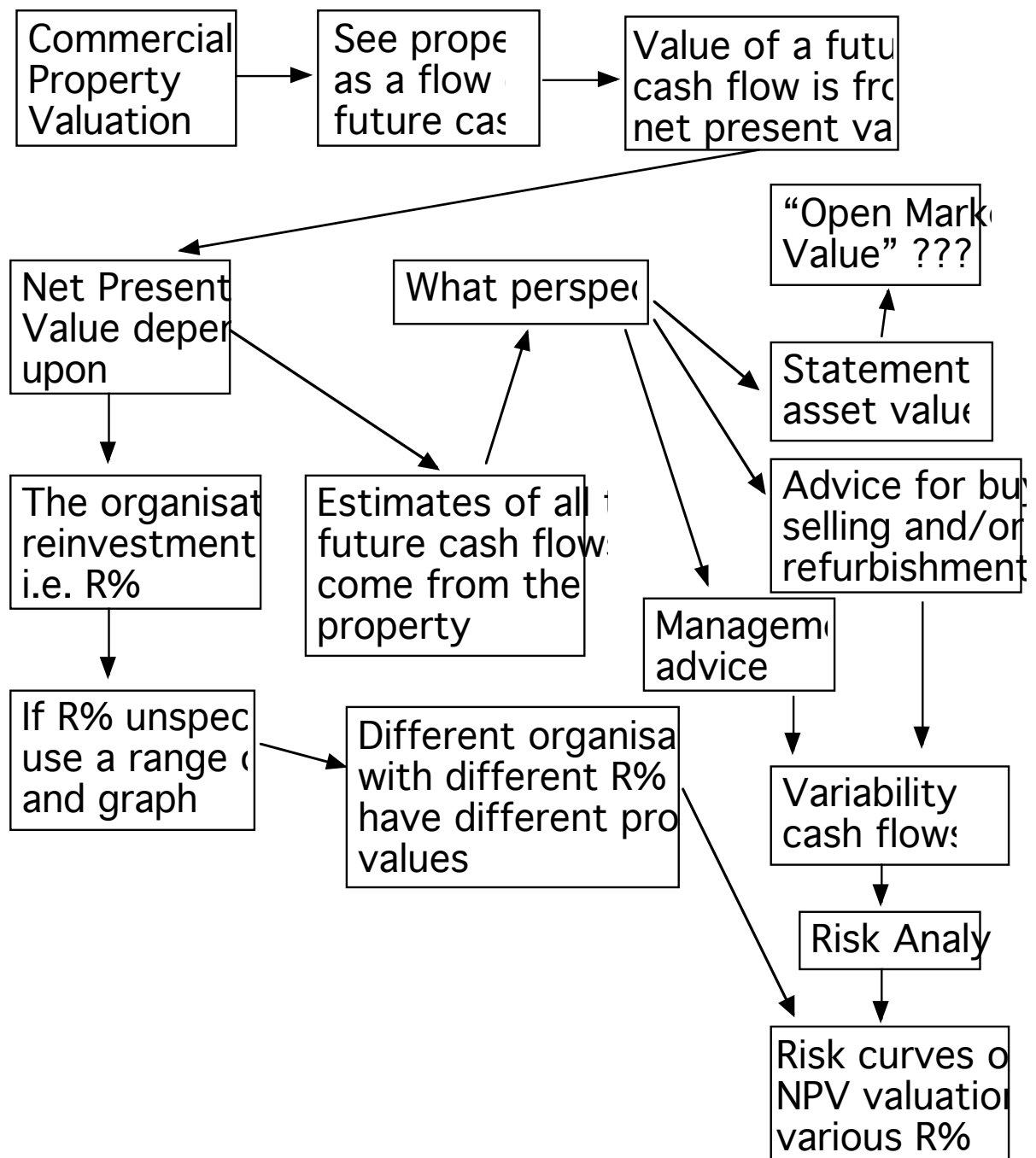
## MONTHLY CASH POSITION REPORT

Month No.	MEAN FLOW FOR MONTH	CUMULATIVE MEAN TO MONTH END	'WORST' CUMULATIVE TO MONTH END	'BEST' CUMULATIVE TO MONTH END
0	-200	-200	-200	-200
1	0	-200	-200	-200
2	-741	-941	-2006	-186
3	-1074	-2016	-2047	-1992
4	-60	-2075	-2138	-2023
5	-110	-2186	-2284	-2104
6	-113	-2299	-2375	-2230
7	-86	-2384	-2466	-2306
8	-45	-2429	-2467	-2382
9	5	-2425	-2468	-2372
10	-6	-2431	-2489	-2367
11	-14	-2445	-2510	-2377
12	5	-2440	-2489	-2380
13	17	-2423	-2474	-2361
14	17	-2406	-2459	-2343
15	17	-2389	-2444	-2324
16	17	-2372	-2429	-2306
17	17	-2356	-2414	-2287
18	17	-2339	-2399	-2269
19	17	-2322	-2384	-2250
20	17	-2305	-2369	-2232
21	17	-2288	-2354	-2213
22	17	-2271	-2339	-2195

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23	17	-2254	-2324	-2176
24	19	-2235	-2307	-2155
25	19	-2216	-2290	-2134
26	1389	-827	-2273	1062
27	1633	806	512	1062

## Appendix 12. Block Diagram Of Property Valuation Approach





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## Appendix 13. Data For Retail Centre Coding

### RETAIL CENTRE DATA VARIATION MAJOR RETAIL CENTRE NET INCOME PROJECTIONS

Year	LOW % PA GROWTH	EXPECTED % PA GROWTH	HIGH % PA GROWTH	CHANCES 2	CHANCES 5	CHANCES 3
1995	2.5	3	3.5	18038	18500	19148
1996	2.5	3	3.5	18579	19055	19722
1997	1.5	2	2.5	18950	19436	20116
1998	3.5	4	4.5	19708	20214	20921
1999	3.5	4	4.5	20497	21022	21758
2000	4.5	5	5.5	21521	22073	22846
2001	3.5	4	4.5	22382	22956	23760
2002	3.5	4	4.5	23278	23874	24710
2003	2.5	3	3.5	23976	24591	25451
2004	1.5	2	2.5	24455	25082	25960
2005	3.5	4	4.5	25434	26086	26999

### MAJOR RETAIL CENTRE END VALUE PROJECTIONS

			YIELD BASE %	CHANC ES 2	CHANC ES 5	CHANC ES 3						
			7.0%	363337	372653	385696						
			7.5%	339114	347809	359983						
			8.0%	317919	326071	337484						
			8.5%	299218	306891	317632						
			9.0%	282595	289841	299986						
			STORE 1	STORE 2	STORE 3	STORE 4	STORE 5	STORE 6	STORE 7	STORE 8	STORE 9	STORE 10
INCOME END VAL.	25434	25434	26086	26086	26086	26086	26086	26086	26999	26999	26999	
	339114	299218	372653	347809	326071	306891	289841	385696	337484	299986		

### YEAR 10 FINAL VALUE MATRIX (FROM ABOVE)

VALUE	CHANCES	STORE
339114	1	1
299218	1	2
372653	1	3
347809	1	4
326071	1	5
306891	1	6
289841	1	7
385696	1	8
337484	1	9
299986	1	10

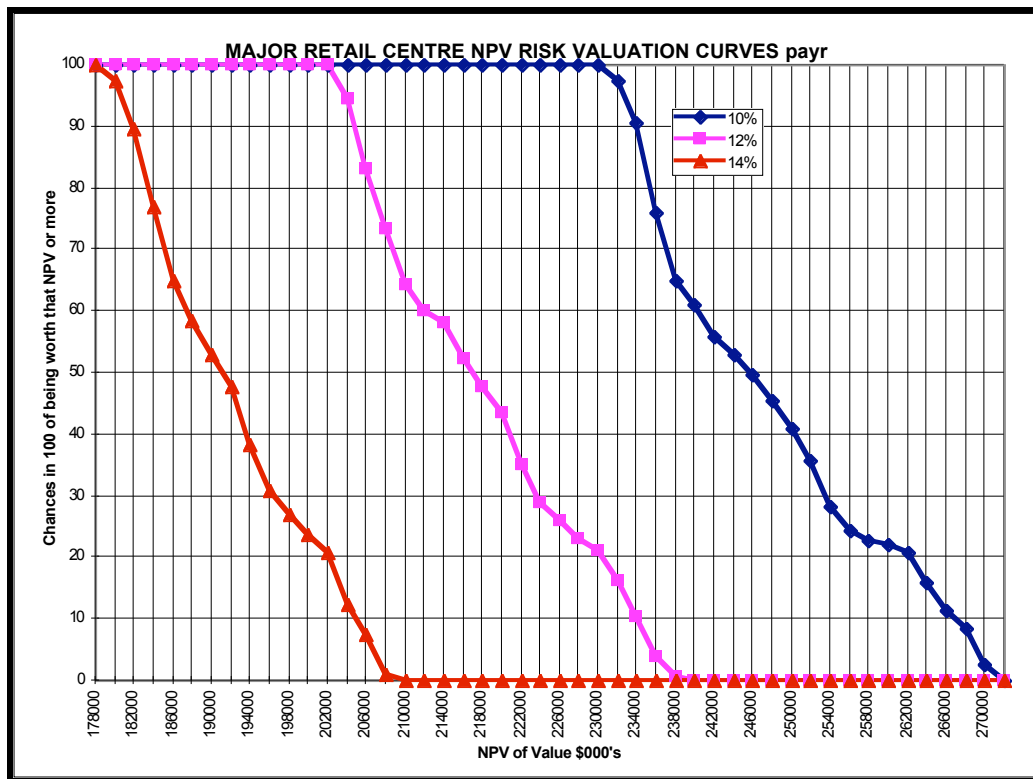
### CAPITAL EXPENDITURE AND REFURB. EXPENDITURES

Year	CHANCES 3 LOW	CHANCES 4 EXPECTED	CHANCES 3 HIGH
1995	8000	8500	9000
1996	3000	3500	4000
1997	3000	3500	4000
1998	1500	2000	2500
1999	8500	9000	9500

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2000	1500	2000	2500
2001	2500	3000	3500
2002	2500	3000	3500
2003	2500	3000	3500
2004	9500	10000	10500
2005	2000	2500	3000

## Appendix 14. NPV Value Graph For Retail Centre



## Appendix 15. Cash Flow Spreadsheet For Commercial Property Valuation

SPREAD SHEET FOR RISK ANALYSIS COMMERCIAL PROPERTY										
CASH FLOW ITEM	YE R	YE R	YE R	YE R	YE R	YE R	YE R	YE R	YE R	YE R
	1	2	3	4	5	6	7	8	9	10
OUT GOINGS	-3000	-3100	-3250	-3400	-3550	-3700	-3750	-3900	-4050	-4250
FIXED INCOME MAJOR TENANT	4936	4940	4940	4958	4973	571	0	0	0	0
VARIABLE INCOME MAJOR TENANT	0	0	0	0	0	4439	2743	2824	4361	5059
FIXED INCOME MINOR TENANTS	2567	2028	1915	1097	363	225	249	129	129	172
VARIABLE INCOME MINOR TENANTS	1283	1331	1763	2571	3562	4728	6516	7125	8886	9532
END VALUE OF BUILDING										10000 0
REFURB COSTS			-3000		-5000	-5000			-3000	
TOTALS	5786	5198	2368	5226	348	1262	5757	6178	6325	11051 2

### NPV RESULTS payr

Rate	NPV
6%	90,520
8%	77,616
10%	66,959
12%	58,116

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### Appendix 16. Risk Analysis Data For Commercial Property Valuation

(From Spreadsheet In Appendix 15.)

10/09/1993	Units \$1000	Discount Rate 10.0%	Number of Loops 200
FLOW No	AMOUNT (\$1 )	PROB	TIME (Years) PROB
[A] [T] [AT] [X] [AX]			
Cash flow No:1 Out goings Year 1.			
-3000.00	10	1	10 N
Cash flow No:2 Out goings Year 2.			
-3100.00	5	2	10 N
-3140.00	5		
Cash flow No:3 Out goings Year 3.			
-3250.00	5	3	10 A
-3300.00	5		
Cash flow No:4 Out goings Year 4.			
-3250.00	5	4	10 A
-3300.00	5		
Cash flow No:5 Out goings Year 5.			
-3350.00	5	5	10 A
-3600.00	3		
-3650.00	2		
Cash flow No:6 Out goings Year 6.			
-3700.00	5	6	10 A
-3750.00	3		
-3800.00	2		
Cash flow No:7 Out goings Year 7.			
-3750.00	5	7	10 A
-3800.00	3		
-3850.00	2		
Cash flow No:8 Out goings Year 8.			
-3900.00	5	8	10 A
-3950.00	3		
-4000.00	2		
Cash flow No:9 Out goings Year 9.			
-4050.00	5	9	10 A
-4100.00	3		
-4150.00	2		
Cash flow No:10 Out goings Year 10.			
-4250.00	5	10	10 A
-4300.00	3		
-4350.00	2		
Cash flow No:11 Fixed Income Major Tenant Year 1.			
4950.00	10	1	10 N
Cash flow No:12 Fixed Income Major Tenant Year 2.			
4950.00	10	2	10 N
Cash flow No:13 Fixed Income Major Tenant Year 3.			
4950.00	10	3	10 N

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Cash flow No: 14 Fixed Income Major Tenant Year 4.	4950.00	10	4	10	N
Cash flow No: 15 Fixed Income Major Tenant Year 5.	4950.00	10	5	10	N
Cash flow No: 16 Fixed Income Major Tenant Year 6.	570.00	10	6	10	N
Cash flow No: 17 Variable Income Major Tenant Year 6.	2500.00	2	6	10	N
	3000.00	2			
	3500.00	2			
	4000.00	2			
	4500.00	2			
Cash flow No: 18 Variable Income Major Tenant Year 7.	2500.00	2	7	10	A
	3000.00	2			
	3500.00	2			
	4000.00	2			
	4500.00	2			
Cash flow No: 19 Variable Income Major Tenant Year 8.	2500.00	2	8	10	A
	3000.00	2			
	3500.00	2			
	4000.00	2			
	4500.00	2			
Cash flow No: 20 Variable Income Major Tenant Year 9.	2500.00	2	9	10	A
	3000.00	2			
	3500.00	2			
	4000.00	2			
	4500.00	2			
Cash flow No: 21 Variable Income Major Tenant Year 10.	2500.00	2	10	10	A
	3000.00	2			
	3500.00	2			
	4000.00	2			
	4500.00	2			
Cash flow No: 22 Fixed Income Minor Tenants Year 1.	2550.00	10	1	10	N
Cash flow No: 23 Fixed Income Minor Tenants Year 2.	2000.00	10	2	10	N
Cash flow No: 24 Fixed Income Minor Tenants Year 3.	1900.00	10	3	10	N
Cash flow No: 25 Fixed Income Minor Tenants Year 4.	1100.00	10	4	10	N
Cash flow No: 26 Fixed Income Minor Tenants Year 5.	350.00	10	5	10	N
Cash flow No: 27 Fixed Income Minor Tenants Year 6.	250.00	10	6	10	N
Cash flow No: 28 Fixed Income Minor Tenants Year 7.	250.00	10	7	10	N

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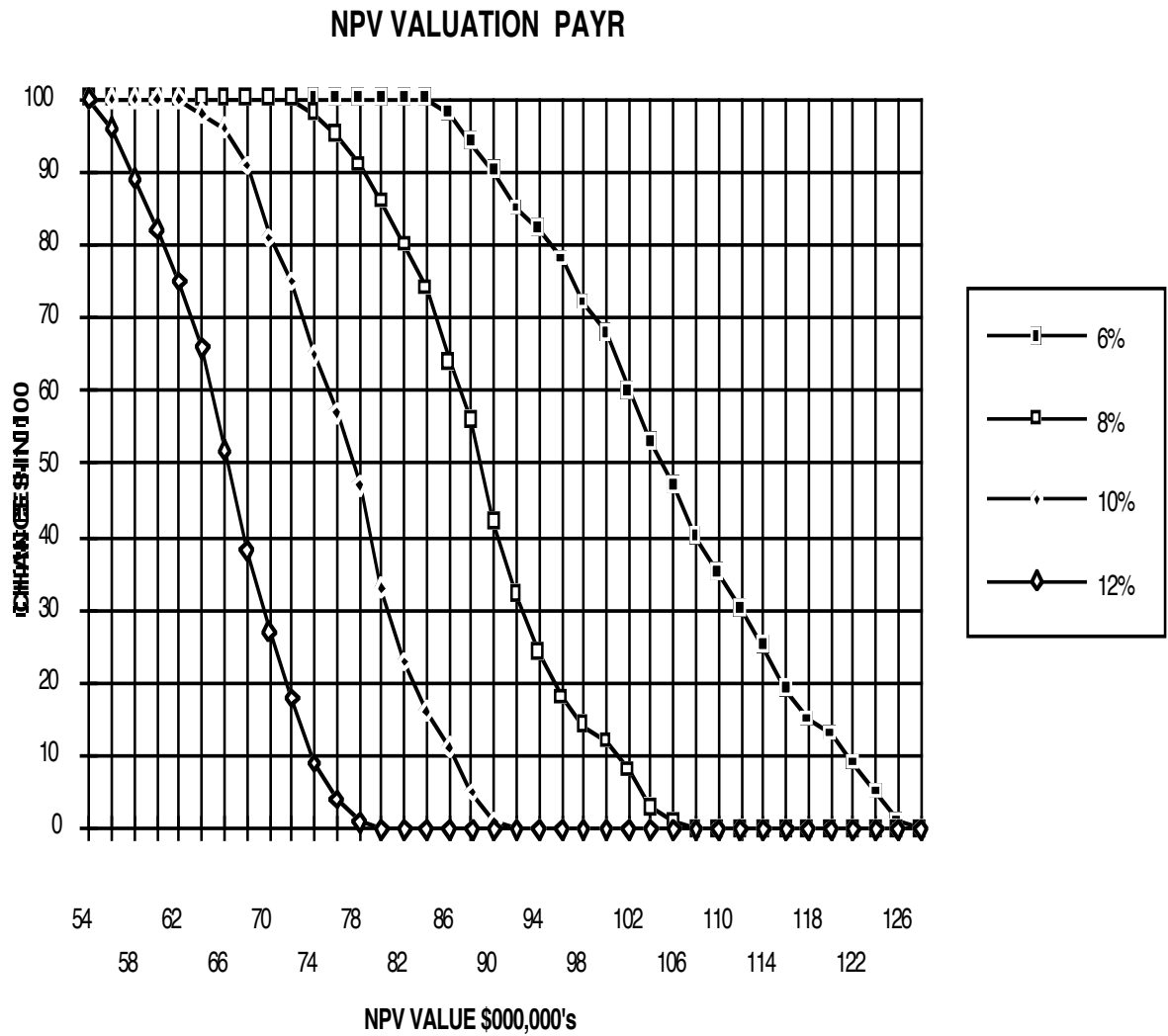
Cash flow No:29 Fixed Income Minor Tenants Year 8.	150.00	10	8	10	N
Cash flow No:30 Fixed Income Minor Tenants Year 9.	150.00	10	9	10	N
Cash flow No:31 Fixed Income Minor Tenants Year 10.	150.00	10	10	10	N
Cash flow No:32 Variable Income Minor Tenants Year 1.	1250.00	7	1	10	N
	1300.00	1			
	1350.00	1			
	1400.00	1			
Cash flow No:33 Variable Income Minor Tenants Year 2.	1250.00	6	2	10	A
	1300.00	1			
	1350.00	1			
	1400.00	1			
	1450.00	1			
Cash flow No:34 Variable Income Minor Tenants Year 3.	1300.00	5	3	10	A
	1400.00	1			
	1500.00	1			
	1600.00	1			
	1700.00	1			
	1800.00	1			
Cash flow No:35 Variable Income Minor Tenants Year 4.	2000.00	2	4	10	N
	2200.00	2			
	2400.00	2			
	2600.00	2			
	2800.00	2			
Cash flow No:36 Variable Income Minor Tenants Year 5.	3200.00	2	5	10	A
	3400.00	2			
	3600.00	2			
	3800.00	2			
	4000.00	2			
Cash flow No:37 Variable Income Minor Tenants Year 6.	4400.00	2	6	10	A
	4600.00	2			
	4800.00	2			
	5000.00	2			
	5200.00	2			
Cash flow No:38 Variable Income Minor Tenants Year 7.	6000.00	2	7	10	N
	6250.00	2			
	6500.00	2			
	6750.00	2			
	7000.00	2			
Cash flow No:39 Variable Income Minor Tenants Year 8.	6750.00	2	8	10	A

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7000.00	2				
7250.00	2				
7500.00	2				
7750.00	2				
Cash flow No:40 Variable Income Minor Tenants Year 9.					
8250.00	2	9	10	A	
8500.00	2				
8750.00	2				
9000.00	2				
9250.00	2				
Cash flow No:41 Variable Income Minor Tenants Year 10.					
9250.00	2	10	10	A	
9500.00	3				
9750.00	3				
10000.00	2				
Cash flow No:42 Building Residual Value Year 10.					
100000.00	1	10	10	A	
110000.00	1				
120000.00	2				
130000.00	2				
140000.00	2				
150000.00	1				
160000.00	1				
Cash flow No:43 Building Refurbishment Costs Year 2.					
-3000.00	3	2	5	N	
-3500.00	4	3	5		
-4000.00	3				
Cash flow No:44 Building Refurbishment Costs Year 5.					
-5000.00	3	5	5	N	
-5500.00	3	6	5		
-6000.00	2				
-6500.00	2				
Cash flow No:45 Building Refurbishment Costs Year 6.					
-4500.00	3	6	5	A	
-5000.00	3	7	5		
-5500.00	2				
-6000.00	2				
Cash flow No:46 Building Refurbishment Costs Year 9.					
-2500.00	3	9	5	N	
-3000.00	3	10	5		
-3500.00	2				
-4000.00	2				



## Appendix 17. Graph Of Results Of NPV Valuations For Commercial Property



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>> 48, 55  
>| 48, 55  
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