The Assessment of Risks Caused by Owner's Delayed Payments

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ABSTRACT

THE ASSESSMENT OF RISKS CAUSED BY OWNER'S DELAYED PAYMENTS

Construction projects are one of the most highly subjective fields to risks and uncertainties, particularly at the bidding stage, where the amount of information about the project is very limited. The contractor should take in consideration the amount of risk associated with the total costs of the project activities in the inception stages in order to reduce unnecessary extra costs that might occur to a project. However under formidable financial conditions, an owner may betake to delay her/his planned periodic interim payments (**PI**) to the contractor later than the expected date. Avoiding this kind of delay is very important for both owners and contractors.

This study presents a simple mathematical model capable of predicting the amount of risk as a percentage of the total cost of an activity should be taken into consideration by a contractor during the bidding stage. However the model analyzes the effect of the delay of the periodic payments made by an owner on the contractor's cash flow and project work schedule, taking into consideration risk factors and quantifying the consequences as a percentage in term of an allowance, within the contractor's bid estimate. A sample case study is used to demonstrate and validate the model. Comparisons are made with existing models to show the effect of incorporating risk factor in cash flow. The model can be applied to any size of projects. In addition, it could be linked to delay analysis systems to enable the contractors to decrease uncertainties that happened at the pre-construction bidding stage and eventually minimize delays in construction projects.

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To Mom and Dad who encouraged and
supported me from
that far

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TABLE OF SYMBOLS

A_D............ Defined periodic repayment figure ($)

A_E............ Effective activity duration

Ao.......... Original activity duration

Ao'......... Activity adjustment duration

Ao*......... Adjusted original activity duration

A_{RED}........ Overall reduction in the critical activity duration

AL............ Allowance needed to offset the consequences of the payment disruption($)

(A/P i,n)....... Capital recovery factor

AFC............ Added financing costs (%)

C_{ET}............ Effective total project costs ($)

Cp............ Over all impact costs (%)

Co_T............ Original total project cost ($)

$C_{<MARED}$..... Accumulated incurred costs up to the period of maximum reduction ($)

C_{RE}............ Effective remaining duration ($)

C_{RO}............	Original remaining costs ($)
CRp............	Periodic cash requirement ($)
CRT............	Total projects cash requirement ($)
D............	Money deposited to earn interest ($)
D_{RP}............	Remaining project duration at period of maximum reduction
E_{PR}	Effective progress reduction on the remaining duration (%)
I	Index value
IC............	Impacted cost on the remaining project cost due too the disruption ($)
I_D............	Interest earned from deposit account ($)
IR............	Increase in remaining project duration index
LRp..........	Periodic loan repayment amount comprising of the periodic principal and interest ($)
MCF.........	Maximum negative cash flow balance ($)
MID.........	Maximum negative cash flow earned from the deposit ($)
N	Number of periods
n	Loan period
NCF_1.......	Net Cash Flow balance for the preceding period.
NCF_2......	Net Cash Flow balance for the current period.
μ	Adjusted Risk Factor
P	Loan money drawn ($)
PD.........	Delayed Project duration (PD = Po + y); y is the period by which payment disruption sustain
PI............	Interim payment received by contractor at current period ($)

P_O............ Original remaining project duration prior to the payment disruption

P_R............ Percentage increase in remaining project duration

W_O .... Activity weight at period i,

$m \le i \le n$

m is the period of the maximum value
n is the project completion date

X_n............ Current Cost

X_B............ Base Cost

CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

The inception stage of a construction project is subjective area for forecasting, where a limited information about the project is available. Therefore, an accurate cash flow forecasting at the bidding stage is the most important element for both contractors and owners. Risk involvement at this stage is an important element that makes the cash flow accuracy and the level of certainty about the project more probable and reliable. Risk is an important part of the decision-making process as well, whereas it can affect productivity performance, quality, and budget of construction project. Risk in a construction project, however, can not be eliminated, but can be minimised or transferred from one party to another, (Roozbeh, 1995).

The contractor normally confronts financial problems as a result of lack of cash availability provided to him/her by an owner, therefore an owner would delay the periodic payments to the contractor resulting extra costs and delays in the work schedule.

In an attempt to reduce unnecessary extra costs that might occur to a project, and eventually minimize delays this research concentrates on the delay of periodic payments made by owners. This will result in planning and preparing for the possible coming troubles that results from owners delayed periodic interim payments

Based on the existing literature, many forecasting models were established, but it is clear that very few studies involved in defining the payment disruptions and work progress.

The work reported in this research analyzes the effect of delaying the periodic payments made by an owner on the contractor's cash flow, and project work schedule, taking into consideration risk factors. The amount of risk is calculated as a percentage in term of cost of an activity, which should be taken into account by a contractor during the bidding stage of a project. The consequences associated with the disruptions would be explained as an allowance factor.

Risk is incorporated as a range of possible values for each possible individual disrupted cash flow, for one and two consecutive periods throughout the project.

The allowance factor quantifies the added financing costs and the impact costs, which reflect the Project's cash flow and work schedule. The contractor has to choose one of two alternatives, either to add the allowance factor directly to his/her bid estimate, or to include it as part of claims dispensation. The methodology of deriving the allowance factor is explained in Chapter (3). To validate the model a case study adopted from the literature was modified and incorporated in the work.

1.2 MISSION AND AIM

The fundamental purpose of conducting this research is to study the effect of delayed payments by owners on contractor's cash flow. The aim being to avoid unnecessary extra costs that might occur to the project, and eventually minimize projects delay. The delay in periodic payments made by owners is one of the important factors that causes delays in a construction project. Contractors tend to reduce this type of delays. As an attempt in doing so, this research deals with developing a model capable of predicting the amount of risk as a percentage of the total cost of an activity, which should be taken into consideration by a contractor during the bidding stage of a project given owners reputation. The model can be used in the pre-construction stage, to analyze the effect of delaying the periodic payments made by an owner on the contractor's cash flow, and quantifying the consequences in term of an allowance, as a percentage within the contractor's bid estimate. The development is based on studying current systems and incorporating current practices.

In order to achieve this purpose, the following objective was determined:

- Develop a model to analyze and quantify the effect of delay of the periodic payments made by an owner on contractor's cash flow and project work schedule, taking into consideration risk factors.

1.3 METHODOLOGY

To achieve the main objective of this research the following steps were performed:

1. A comprehensive literature review was conducted. Relevant knowledge was presented to acquire a good understanding of the contractor's cash flow environment and to state the financial forecasting and payment control to contractors in the construction industry.

2. Study the current practices and techniques that deal with delays in early stages of construction project's life cycle, in order to determine the rudimentary points in the existing models. In the light of this study a further development of an existing mathematical model, namely contractor's approach to offset the consequences of interim payments disruptions caused by the owner, to include risk was performed.

3. Case studies are performed to test the model according to the following criteria:
   - Cash flow was established and different scenarios were run to determine the probabilities that the disruptions could happen in the contractor's cash flow.
   - A model was established and the risk adjustments were added, as a range of possible values for each possible individual disrupted cash flow, for one and two consecutive periods throughout the project.

4. A comparison between the cash flow model results before and after incorporating risk had been done, to show the effect of incorporating risk factor in cash flow.

1.4 THESIS ORGANISATION

This thesis is divided into six chapters as follows:

- Chapter two covers a review of the literature and relevant background. All the related factors deal or affect contractor's cash flow are discussed in the literature review. In addition, this chapter outlines the general delay tools and techniques, which are currently used in the construction industry. The literature review part deals comprehensively with risk analysis.

- Chapter three identifies the main consequences associated with delaying the periodic interim payments by owners`, through reviewing existing models. It also presents the advantages and disadvantages of these models. A mathematical model is introduced in this chapter and its advantages are highlighted.

- Chapter four deals with the current model validation through a case study.

- Chapter five discusses the results of applying the developed model to the case study.

- Chapter six presents a summary of the work, which has been done in this research and concludes with some recommendations for further research.

CHAPTER II

BACKGROUND

2.1 CONTRACTOR CASH FLOW

Contractors deal with cash flow at the estimating and tendering stages of a project, in order to achieve more efficient and more accurate cash flow to avoid delaying the project, which might lead to extra expenses or work stoppage. Cooke and. Jepson, 1979 define the cash flow as the actual movement of money into or out of the company. Money paid out are termed negative cash flow (-ve) and is debited to the business. Money flowing into are termed positive cash flow (+ve) and is credited as cash received, as shown in fig (2.1). Normal project financing is done through progress payments, which means that the contractor receives a certain amount of money each agreed upon period, for the work performed during that period. This periodic approach results in a funding pattern called cash flow, (James M. Neil 82).

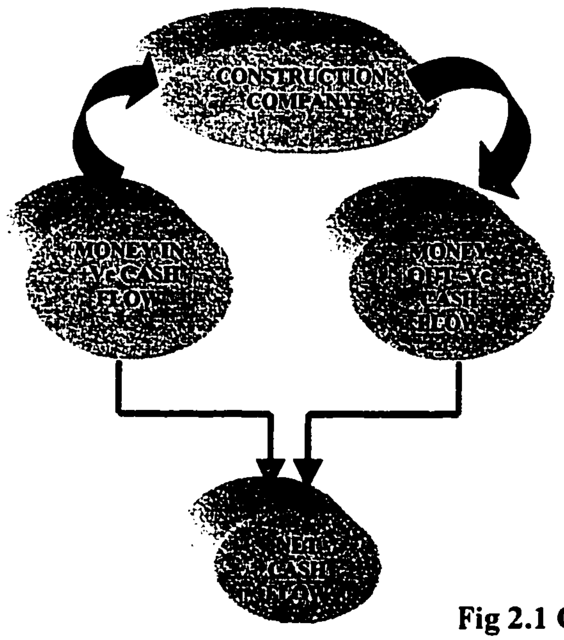


Fig 2.1 Cash flow diagram

The contractor is known as one of the main parties in the construction industry. He/she makes a great effort in the success of the construction process that clearly appear in the planning stage because well prepared contract reflects good profit to the contract or/and the company. The cash flow requires the combination of estimating and planning evaluations, fig (2.2). **Estimating** evaluates the use of resources in term of **cost** and **planning** evaluates the use of resources in term of **time**. Adding both together is necessary to obtain the cash flow, (Harris and Mc Caffer 1989).

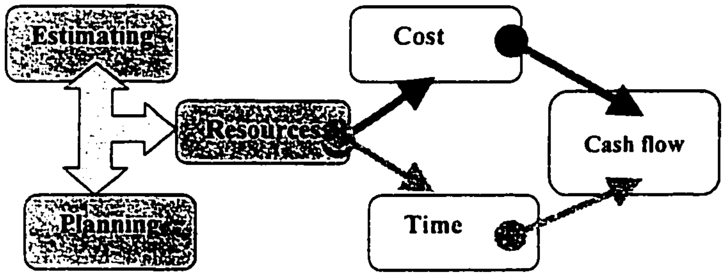


Fig 2.2 Cash flow evaluations

Awad (1993), developed a deterministic mathematical model to assist contractors in quantifying the consequences of interim payments disruptions caused by owner. This disruption is converted to a percentage, in terms of cost that would interpret as allowance factor which considers the effect of payment disruptions on the project cash-flow and work schedule by quantifying the added financing costs and the reduction in progress rate.

Sadi (1995), according to his survey of contractors owners and Architects/Engineers on causes of delay in large building construction projects, concluded that the most important delay factors from the contractor's point of view were drawings preparation and approval, delay in contractor's progress, payment by owners and design changing by owners. On the other hand the important delay factors according to the owners are design errors, labour shortages, and inadequate labour skills. Cash problems during construction, subcontractor's schedules in the execution of the project and the slowness of the owner's decision making process are the most important delay factors for the A/Es.

Easa (1992), introduced a mixed-integer optimisation model that maximise the contractor's profit for progress payment contracts, and formulated other scheduling objectives such as levelling the overdraft and minimising the maximum overdraft.

2.2 BIDDING STRATEGY

The area of bidding strategy has strongly polarised various researchers since 1950's. Most of these researchers have been interested in the development of such systems or probabilistic models that can predict the chances of winning. Probabilistic models attempted to give guidance to bidders by producing statements of the type: 'If you bid at a mark-up of 12% you have 30% chances of winning this contract' (Harris & McCaffer, 1977). Therefore, numerous models (Ahmed and Minkarah 1988; Shash 1993; Mosehi and Hegazy 1993;Ting and Mills 1996; Fayek 1998; Alfekhfakh et al. 1996;Photios et al. 1993; Richard et al. 1994) have been developed, specifically for construction projects, but not all of these models are used in the actual practices of construction industry. For example, Moselhi (1993) developed a decision support system.

This system uses neural works for optimum mark-up estimation that give solutions to new bid situations based on previous projects. The uncertainties in the contractor's assessment of project risks were taken in consideration by using sensitivity analysis technique. While (Fayek, 1998), introduced a model that used techniques of fuzzy set theory to help a company to achieve its objectives in bidding. It can also be used as a training tool for understanding the corporate decision making process used in setting margin. The model provided more than 90 factors that might influence the choice of margin size.

Normally, such typical routines occur at the pre-construction stage of any project. Acquiring tender is the first step to awarding a project contract. The purpose of that is first, to select the applicable contractor that suits the project circumstances. Second, the price exposition from the contractors at an appropriate time is important whereas this tender is the base for producing the contract. Legal analysis procedures recognised that there are two different kinds of tenders. **The first**, which is comparatively rare, is a " Standing offer", under which a contractor tenders for, say such maintenance work as may be required by the employer over specified period. **The second**, and more usual, type of tender is simply an offer by the contractor to carry out the work specified in the invitation to tender (John et al, 1996).

2.2.1 Bidding Process

Under the traditional format the biding documents consists of specifications, quantities and drawings. At first, the subject of issuing bidding documents (plans and specifications and related materials) seems like a minor one. Yet if not properly handled, particularly on public works projects, serious claims or project delays can result (Edward, 1997). Figure (2.3) illustrates the lifecycle bidding process that occur at the pre-construction stage where owner and contractor play the main role in such a process as following:

- Owner and his/ her professionals staff or advisors prepare the bid document and send it to various qualified contractors inviting them to bid in a project.

- Contractor has to study specifications and prepare the project cost estimate. The contractor preparation of the project cost estimate prior to submitting the bid is the concerning activity for the purpose of this research, figure (2.4) shows various activities that occur during the contractor's project estimation stage (Awad, 1993). The successful contractor prepares her/his bid price based on past experience, historical data and a vast amount of information to forecast the direct and indirect costs, margins and project's duration (Habib, 1996).

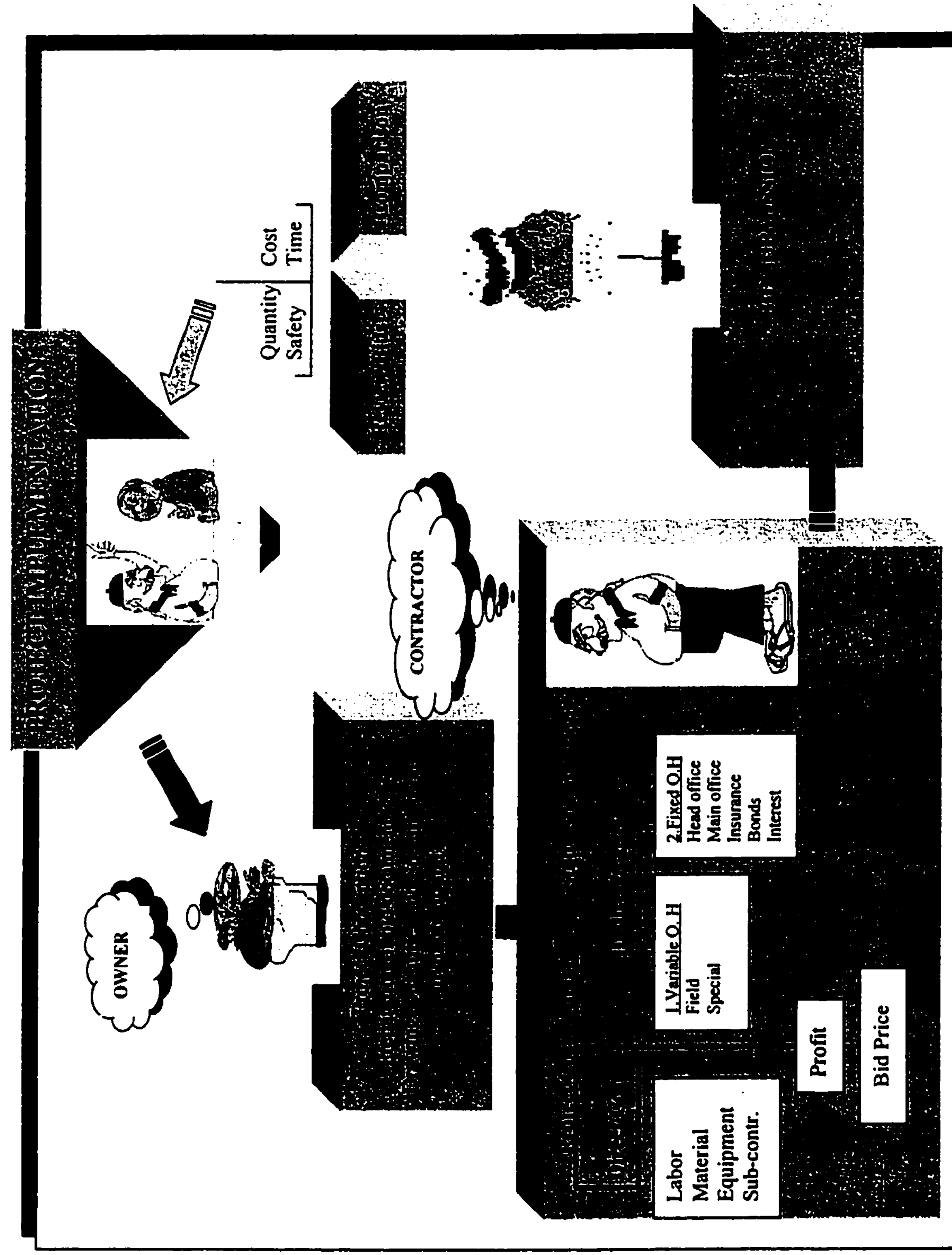
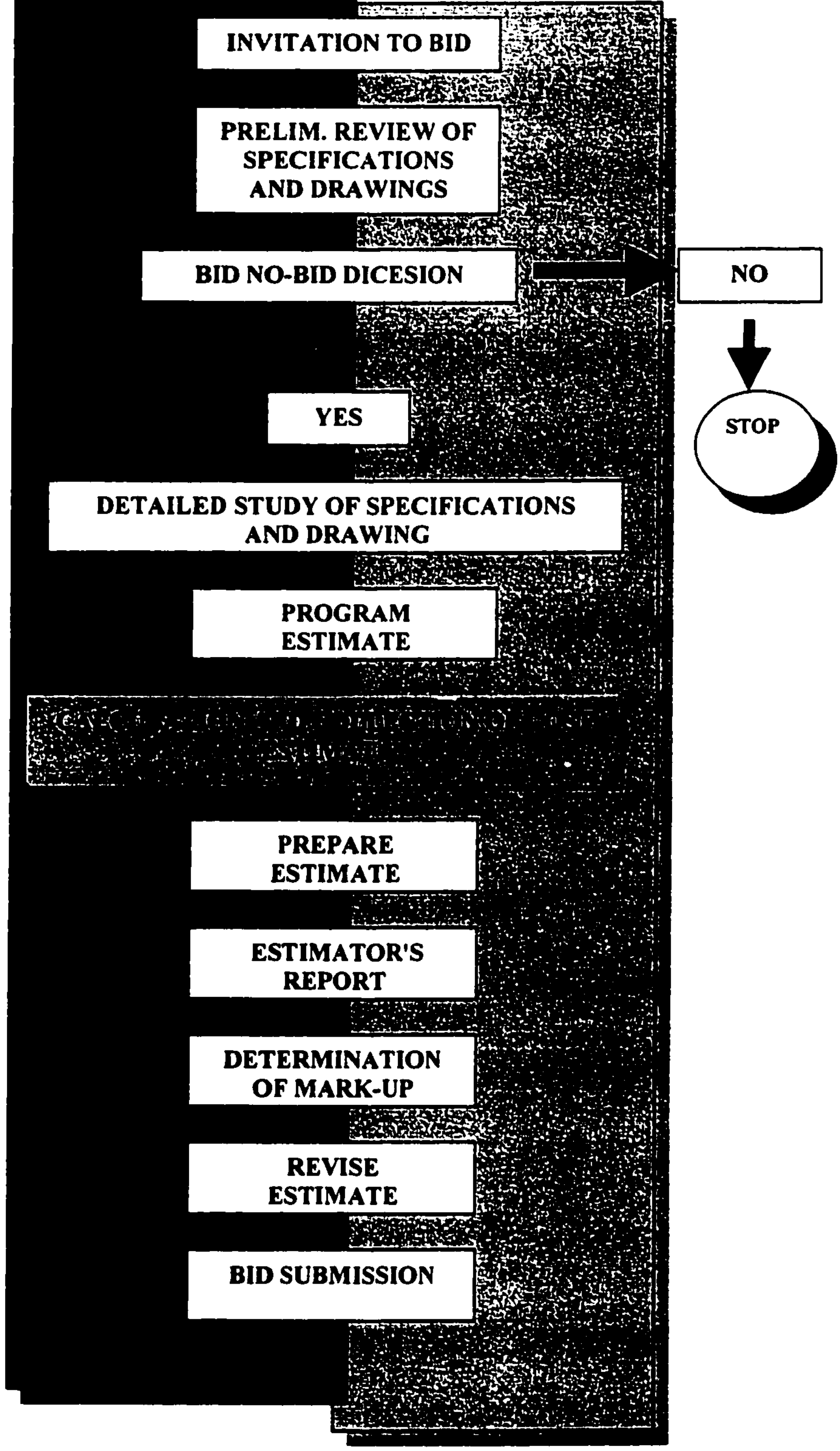


Fig. 2.3 - Bidding process life cycle

Fig. 2.4 - Project estimation



1. The contractor must transform the two main elements, namely Direct and Indirect costs into a bid. Direct costs are direct labour, direct material, subcontractors, and equipment and engineering costs while Indirect costs subdivided into variable and fixed overhead costs. Overhead is defined as the costs to do business (Semour et al, 1976). Variable overhead is further sub-divided into field and special overheads while the fixed overheads include head office and main office. Fig (2.5) summarises the factors that could include in bid price.

2. After quantifying direct and indirect costs, a higher management will then determines the profit portion. This profit portion will be added as a percentage to the project cost estimate. The mark up established. The mark up is a critical factor that needs to be considered by each contractor as it reflects the chances of winning the bid.

3. Once the bid is established, it will be submitted within the specified period.

4. The owner reviews the bid under four main categories, time, cost, quantity, and safety (Rankin et al, 1993).

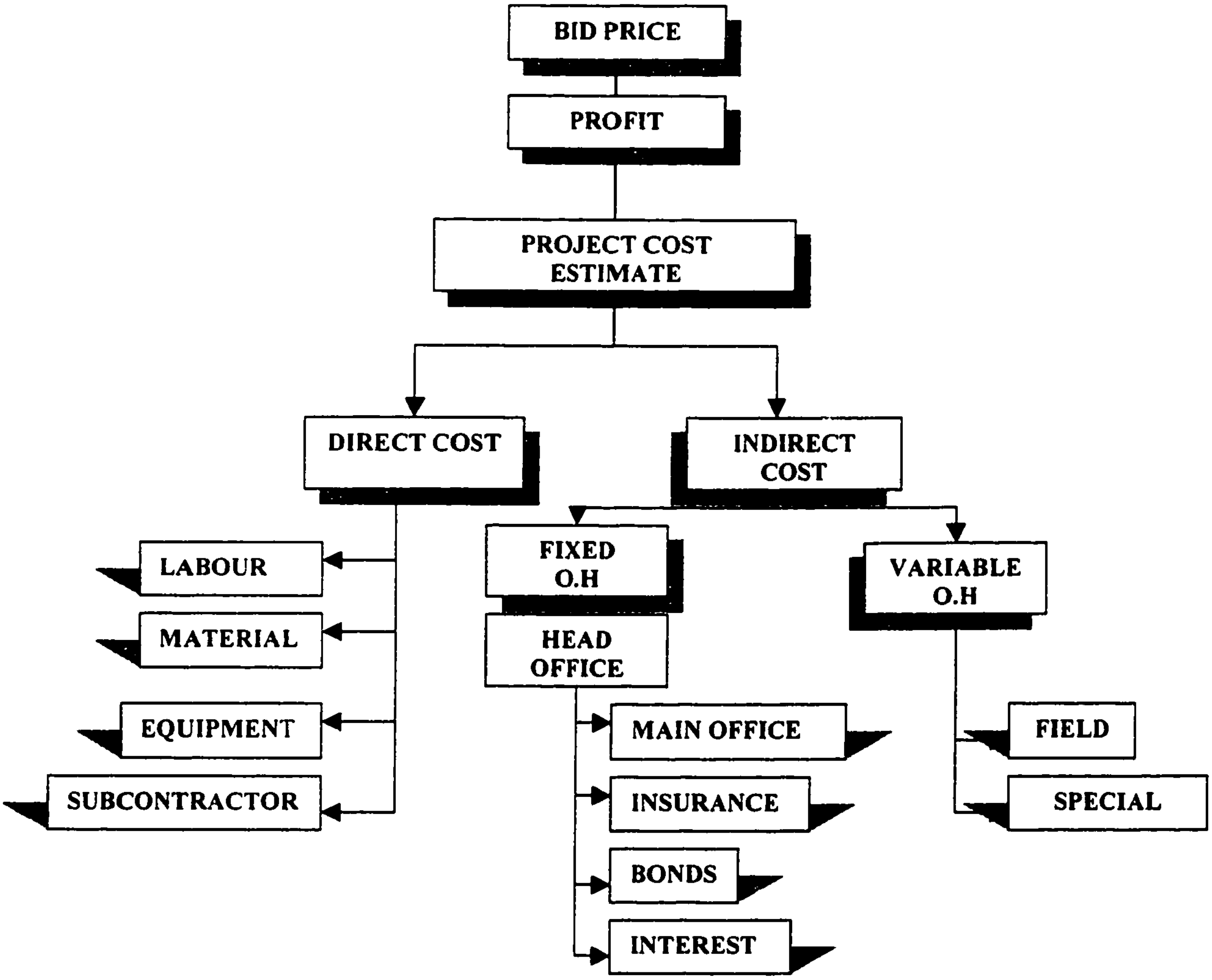


Fig. 2.5 - Summary of factors that could be included in bid price

2.3 DELAY TOOLS AND TECHNIQUES

Time and cost are the two major factors to consider when pricing construction work. The contractor's objective, being the completion of work within the period of time specified in the contract at the minimum cost (Kallo et al, 1990). If changes are made to the scope of the work then the project might be delayed and extra cost incurred.

Different parties can cause delays in construction industry. There are four general categories of responsibilities for construction delays (O'Brien, 1980):

- Owner (or his agents) being responsible.
- Contractor (or his sub-contractors) being responsible.
- Neither contractual party being responsible.
- Both contractual party being responsible.

The interim payment disruptions by the owners to the contractors are one of the important causes of construction delay, (Awad , 1993). The following Chapter proposes a new model, which accounts for delays caused by interim payments to the contractor by the owner taking in consideration risk factor. Most of the existing delay analysis techniques that are available to contractors can be only applied once the delay has occurred or upon the project completion. While the proposed model account for delay at the forecasting stage of the project, that could enable the contractor to avoid and predict such a kind of delay, and secure the work schedule from being affected at later dates.

2.3.1 Types Of Construction Delays

There are three main concerns in ensuring the accuracy of delay analysis. They are: proper classification of delay types (**excusable compensable, excusable noncompensable**, and **Non-excusable**), concurrent delays and real time analysis. (Alkass et al, 1996).

Excusable delays are events beyond the contractor's control, once this kind of delay is identified, the contractor would entitled to a time extension. Excusable delays can be classified into Compensable and non-compensible delays.

Excusable compensable delays are caused from the actions or in-actions of the owner. The contractor is entitled in time as well as a monetary compensation associated with the delay (Reams, 1990).

Excusable non-compensable delays are neither the contractor's nor the owner's fault. The contractor would only entitled to a time extension. These delays are due to unforeseen reasons beyond the control and without the fault and negligence of the contractor (O'Brien, 1980).

Non-excusable delays are delays, which result from the contractor's or sub-contractors actions or in-actions. This type of delay presents no entitlement to a time extension or delay damages for the contractor if the delay can be proved to have affected the whole project (Alkass, 1996).

2.3.2 Types Of Schedule

Several techniques and procedures are produced for analyzing schedule impacts to determine the effect of delaying events upon the total project duration. Scheduling techniques (critical path methods or bar charts) are normally used to evaluate the delays that caused from a specific impact. The following are the main schedules that are used:

- As-Planned schedule: illustrates the contractor's original plan for performing the project and it does not present the work progress. The critical path(s) is included along with the planned activities and their start and finish dates.

- As-Built schedule: illustrates the actual work that has already been done during the execution of the work. As the work progress, the schedule is updated in order to recalculate the updated project duration if it had been impacted. Thus at the end of the construction work, a new schedule is established which is as-built schedule (Arditi et al, 1989, Alkass et al, 1991).

- Adjusted schedule: Explain how delays or any kind of changes has affected the as-planned schedule, when they are incorporated in the schedule.

- As-Projected schedule: it preformed during the updating process to show the expected project completion date. It includes the as-built data for the work that already completed and the remaining proposed work.

- Entitlement schedule: used to determine the impact on the project completion date due to excusable delays (Reams, 1990). It shows the difference between the adjusted and the projected completion dates.

2.3.3 Delay Analysis Techniques

The following are the current techniques that are used for delay analysis in the construction industry (Mazerolle, 1992):

- Global Impact Technique
- Net Impact Technique
- Adjusted As-built CPM
- "But-For" Technique
- Snapshot Technique
- Time Impact Technique
- Isolated Delay Type Technique

Extensive research has been published in this area by several authors. David et al, (1998) presented a new method of delay analysis. It is step by step approach that could be used by contractor to estimate the extent of an expected delay on the completion date for the work, as a result of delays in activities encountered during the project. This method allows the assessment of three important issues at the same time: the progress of the project at the time the delay occurred; the changing nature of the critical path; and the effect of action taken to minimize potential delays.

Alkass et al. (1996) discussed the advantages and the shortcomings of different delay analysis techniques that are used in the construction industry by using a test case, and also proposed a delay analysis technique called the isolated delay type (IDT). The proposed technique addresses the main concerns for ensuring the accuracy of a delay analysis (proper classification of delay types, concurrent delays, and real time CPM analysis) while all other techniques did not consider all the three issues at the same time. On the other hand, Zartab (1996), discussed a delay analysis based on contemporary documents and critical path method to understand the cause of project delays. The author determined some faulty delay techniques which should be avoided in the analysis of the construction industry, because of the problem associated with them. These problems are as follow:

- impacted baseline schedule;
- after-the-fact and modified CPM schedule;
- dollar-to-time relationship:
- "but-for" schedule/arguments; and
- Collapsed as-built analysis.

Zartab concluded that the owner and the contractor should know the proper delay analysis and be encouraged to use it in resolving construction disputes, and using faulty techniques to analyse construction project should be discouraged, and the analyst should be aware of the shortcomings of the wrong techniques.

Schumacher (1995), clarified that the contractor documents should be reviewed to determine who is responsible for delay.Also he explained the importance of the Critical Path Method (CPM) technique, to address the interrelationship of delay damages where a critical delay by contractor and a critical delay by owner can occur on the same period of time on a different critical path. These interrelationships cannot be addressed properly without using CPM. Furthermore, he Quantifyed the techniques that are used to measure the delays. These techniques being used by the industry over the last 30 years.

2.4 RISK ANALYSIS

Risk analysis is the quantification of the probability of each risk's occurrence and the potential severity of the impact of each risk upon the project. Once the risks are exposed by the risk assessment phase, the engineer further defines the risks, defines how much Contingency is needed to achieve the target Cost, and determines the estimate range. This is done by applying the appropriate Risk Analysis Technique (Richard, 1997).

2.4.1 Risk Management Definitions And Phases

"Risk and uncertainty are the process of developing probability distributions for investments"

The AACE International's risk dictionary defined risk as following:

- Risk is the same as uncertainty, i.e., risk = threats + opportunities.

- Risk related to unwanted, undesirable outcomes, i.e., uncertainty = risk + opportunities.

- Risk is the net impact of uncertainty, i.e., risk = threats opportunities

According to the AACE International's risk management dictionary, there are various definitions of risk management while there is agreement that there are sequential activities used to manage project risk, these activities are called different names. According to the same dictionary risk management is all of the following phases associated with managing them. **The first** phase is risk assessment, which include the identification of risks or uncertainty that may affect a project. **The second** phase is risk analysis, which includes the quantification of the effect of all uncertainty (risk) on a project. **The third** phase is risk mitigation, developing a risk management plan. **The last** phase is risk control, which is the implementation of the risk management plan.

Risk management plan is the product of risk mitigation (the third phase of risk management); it is a list of the action steps to do the following things:

- eliminate or reduce the probability of a threat occurring;
- eliminate or reduce the impact of the threat if it does occur:
- ensure or increase the probability of an opportunity occurring; and/or
- increase the impact of an opportunity if it does occur

2.4.2 Existing Risk Analysis Methods

Risk Analysis can be done using a variety of methods, ranging from standard checklists to mathematical models. Experience has shown that the each method is appropriate under specific circumstances. Methods fall into three general types (Richard, 1997):

- **<u>Quantitative Approaches</u>** (checklists, historical databases of typical risk levels, heuristics, etc.): assess risk based on project characteristics, e.g., type of work, location, etc. Using historical experience, quantitative methods relate project characteristics directly to the contingency requirements, expressed as a percent of the base estimate costs. The percentages may be developed from checklists or by matching project characteristics to the characteristics of previously completed project stored in a database.

- **<u>Risk Models</u>** (techniques for subdividing the estimate, assigning ranges to each grouping, and determining the total probable impact of the estimate): break the estimate into components and the engineer analyses risk directly for each component. Typically the components are :

1. Estimate categories (work break dawn structure)
2. Parts of the project (systems and/or areas)

3. Equipment, material, labor, overhead, and engineering

The risk model combines the risks mathematically, incorporating statistical adjustments.

- **Probabilistic Models**: calculate the actual probability distribution curve for a project either by "constructing" the project numerous times (the Monte Carlo Approach) or by applying sophisticated mathematical techniques (Decision Tree Approach), the use of Monte Carlo simulation in the construction cost analysis is of interest to construction professionals as part of construction projects (David, 1997). Probabilistic Models may start with direct input of risk associated with component and each component of the project may be affected by more than one risk source.

2.4.3 TIME- UNCERTAINTY ANALYSIS

Gong (1997) presents a procedure to optimize the use of float in a project network. He concluded that the development of this procedure provides a quantitative solution to integrate the analysis of project costs into the risk analysis-based project scheduling. Furthermore, he introduced a concept time dependent cost (TDC) and time disturbance analysis to achieve the optimization of float use and thus the development of this optimization procedure provides information for project managers to help them understand the interactive risks of project schedule and cost.

Farrell (1996), presented a method for incorporating the liquidity premium into the net present value under uncertainty analysis. Many projects should be rejected because of the absence of an appropriate liquidity premium adjustment

Gong (1993), introduced an analytical merge-event time-estimate technique. It called The Back-Forward Uncertainty-Estimation (BFUE). The BFUE procedure is consistent with the PERT procedure and critical path method. It included the time uncertainties of noncritical path activities in the risk analysis of a project network. The procedure is a development of the current merge-event time-estimation techniques, since it evaluates the project time risk related to the use of slack time in a project network, beside the correction of the optimum estimation bias caused by the PERT procedure.

Gong (1995), introduced a new concept of time-disturbance analysis backward-pass for a project network. A time disturbance can be caused by uncertainty of non critical activities. The possibility of a time disturbance can increase, when noncritical activities overspend some or all their floats. TheTime-disturbance analysis is demonstrating the change of the expected time of a given merge event with the changes in float use of noncritical activities and indicate a solution related to the float allocation to reduce the time disturbance in a network, therefore, time-disturbance analysis can assist a project scheduling to reduce project risks rationally.

Based on classifing risks into two categories:internal or external, Diekmann, et al, (1996) developed a new technique for Project risk analysis by using influence diagrams. Internal risks are those inherent to a specific project and they usually affect items in the project cost estimate, on the other hand external risks can influence the project cost but are not found in the cost estimate. The paper described the risk analysis formulations and developed them to evaluate internal and external projects risks. Using Monte Carlo risk analysis methods are not power enough to to deal with the range of risks and uncertainties from the authors point of view, sence its ability is to determine the degree of risk associated with quantifiable project elements, but it is less effective in analyzing external risks. As a result they evaluated how Monte Carlo methods or Monte Carlo methods in conjunction with influence diagrams can be used to model and evaluate the entire range of projects risks.

2.4.4 Risk Allocation

Hartman (1997) discussed the wording effectiveness to improve risk allocation in lump sum contracts. This study reports the testing of a revised Canadian Standard Lump Sum Contract against its predecessor. A survey was done to measure the degree to which the contracting parties interpreted each contract clause in the same way and then a comparison between the old and the revised clauses were done. By virtue of the results of this survey, the author concluded that there is an agreement between contracting parties on how risk liability is assigned in standard contract clauses. Contract clauses do require some discussion between contracting parties to achieve a true meeting of the minds. Appropriate modification or classification maybe needed for the clause to become effective in allocating risk, Including a process of identifying and allocating risks within the contract during its execution. The author ensured that sharing risks implies that all contracting parties take responsibility for effective mitigation of all risk events.

Takayuki (1998) concerned on the aspect of a project risk management under the precept of management functions at the corporate level. The author classified the project risk into two types: (1) Dependent risk that arises from the interaction of risk factors on multiple cost elements; and (2) Independent risk that affects the total risk of a project independently . He developed a mathimatical model to estimate the uncertainty of cost element by which the expected performance of a cost element analyzed in accordance with the overall project performance. This study provides a systematic, ligical way to quatify risk at issue and facilitates the efforts required to gather information for the analysis.

Zack (1996) had discussed risk management, past, present and the purpose of allocation risk, then turned to how project risks are handled in a current industry standard construction contract . The article highlight the risk allocation clauses, refernces specific contract clauses, and labels each clause as either risk-assignment, risk-assumption, or risk-sharing.Under the Time-related Zack allocates the risk of delay in three ways. (1) Owner-caused delay is assumed by the owner and will result in time and money flowing to the contractor.(2)Contractor-caused delay is assigned to the contractor,who will make up the time or pay late completion damages. (3) Third party-caused delay is shared in that the contractor gets time, but no money and the owner grants time and gives up the right to late completion damages. In case of work suspension by the owner, the owner assumes the risk.Under the economic risk, performance, payments and other bonds,the contractor is assigned the risk of providing all required bonds for the performance and full payment of the contractor's obligations.

2.4.5 Risk In Term Of Cash Flow And Work Schedule

Two interrelated clauses need to be considered within the context of this research: the contractor's cash flow and Project's work schedule, in order to conform the factors affecting risk. In the case of cash flow, a large number of mathematical and statistical models have been applied to cash flow forecasting, (Kenley et al 1989, Singh 1989, Kaka et al 1991, Kaka 1993, etc). Kaka (1996), indicated that the previous cash flow forcasting models for individual projects were inaccurate and inflexable in terms of the extent of veriability of the profiles produced. A lack of Five factors in those traditionl models were identified. On the light of that a computer-based cash flow model as an aid to contractors in forcasting more accurrent cash flow, incorporating some of the risk associated with construction contracting was developed. While Navon (1996), clarifyed that some cash flow forecasting models do not take in consideration time lags and billing periods, and consequently do not reflect true expences and incomes.

Boussabaine and Kaka 1998, introduced an artificial neural network method for predicting the cost flow and demonstrate the short comings of the existing forecasting methods. A model was developed based on non-linear techniques. However after investigations, analyses, and test the model, they indicated that a neural network approach is more accurate than traditional methods. Navon (1996), introduced a mathematical cash flow forecasting and updating model for projects with limited data, at design or bidding stages. The model could include the company's entire projects in the company's cash flow forecasts Easa (1992), introduced a mixed-integer optimisation model that maximise the contractor's profit for progress payment contracts, and formulated other scheduling objectives such as levelling the overdraft and minimising the maximum overdraft.

On the other hand having a realistic completion dates is very important and very critical too, therefore contractors need to pay more attention to prepare realistic schedules. This is an interested area that some research work is carried out.

Bruce et al. (1996), indicated that scheduling processes generally ignore the effects of uncertainty by using a single value for the time estimate of each activity despite the fact that every construction project there is some element of risk in all activities which could affect the schedule. A development of a system for the assessment of schedule risk was carried out. The direct pictorial information to assist the decision-makers in selecting a realistic yet acceptable project completion time, is one of the three main key features in this system. The output of the system includes the schedule confidence limits and the critical path risk profiles.

Pedwell et al (1996) introduced computer model to be a valuable tool, especially during the conceptual stages, which help determine the probability of completing a project within any specified time and cost successfully.

Moselhi et al, (1996) examined and rationalised float use considering uncertainties in estimated activity duration through a scheduling system called (C-PATH). The system is capable to provide detailed activity and path analyses identifying which activities have significant impact on the project schedule, and also it quantify risk in project scheduling easily.

2.5 TIMING OF PAYMENTS

Since this research deals with the interim payment disruptions that could happen to the contractor cash flow, which caused by owner, therefore the payment timing is as important item need to be taken into consideration. Payment timing is an essential to contractor when constructing a cash flow forecast for the bid. It is common in the construction industry that the contractor is liable to pay the sub contractors whether he/she received the owner interim payment or not. Thus, when the owner delay the interim payment, the contractor has take the entire financial load for project in order to go on the project. Hence, These kinds of problems engaged some researchers. The following are some guidance and solutions for delaying the payments:

Funduk (1991), suggested that the contractor could include a clause to allow him/her to hold the subcontractor's payment unless the owner agreed to pay the contractor

To avoid delays in owner payments, Schleifer (1990) suggested guidelines. First, the contractor had to invoice on time and accurately. Second, the contractor had to establish good credibility and standard procedural routine with architect/owner at a very early stage of the project.

Awad (1993), developed a mathematical model that help the contractor to identify and the consequences in the contractor's interim payments by owner on the cash flow, and quantify theses consequences in term of allowance, as a percentage within the contractor's bid estimate.

Navon (1996), presented a cash flow forecasting and updating model that could be used in design and bidding stages where detailed data is not available, taking into account time lags and billing periods. The author defined the billing period as, the time difference between the bill is submitted and the progress payment made (time lag).

2.6 SUMMARY

This chapter had reviewed the literature related to the financial forecasting and payments control to the contractors in the construction industry and quantified the uncertainties associate with contractor's cash flow through systematic approaches available on the market. Different cash flow forecasting models have been discussed, and their advantages as well as their limitation have been outlined. Based on the existing literature, it can be seen that a few studies involved in defining the payment disruptions and work progress.

Awad (1993) performed the only study that deals with this relation directly, but it is clear that no further studies are established since then. In addition, there has been no studies done with the respect to the quantification or prediction of the amount of risk of the total cost of an activity with regard to the contractor cash flow, specifically, in disruption that could happen in the periodic interim payment made by owner. Meanwhile, several authors (Funduk 1991, Schleifer 1990, Navon 1996), had performed studies indicating the importance of payment timing, and give a helpful guidance that could help the contractors.

Risks and uncertainties has been the concern of researchers in the construction industry starting from risk allocation and ending of risk in term of cash Flow and work schedule. It can be seen that almost all of the net cash flow models mentioned in the literature do not take into account risks and uncertainty that is incorporated in the disrupted payment made by the owner, and/or how it affect the contractor cash flow. In the light of the results of this literature review, it can be seen that there is some work need to be carried out.

This research concentrates on the pre-construction phase of construction projects, since decisions made during this stage are not accurate and there is a lot of forecasting in this stage including the cash flow. Three main areas related to contractor's cash flow have been investigated during the literature review: Bidding, delays and payments. Bidding is an important decision-making process that takes place in the pre-construction stage. Any decision made at this stage will affect the performance of the entire project. However, the mark-up figures that the contractor includes in her/his bid price, affect the chances to win or lose the bid.

CHAPTER III

DEVELOPING A MODEL FOR THE EFFECT OF DELAYING OWNER'S PERIODIC PAYMENTS ON CONTRACTOR'S CASH FLOW

3.1 INTRODUCTION

As was mentioned in Chapter (2), contractor's cash flow and project's work schedule are the most related factors to the uncertainties of payment timing by the owner. Cash flow as defined in the previous section is based on work completed within a specified time, and work schedule is depended on the periodic payments that are made by the client. Any delay in the interim payments will cause delinquency in the contractor's cash flow. In order to avoid this liquidity, and to avoid delays in the work schedule, extra funds are required. Therefore, the contractor has to choose one or more of the following options:

- To locate extra funds to cover the shortfall in the available cash, in this case it will cost the contractor extra money in terms of interest.

- To be behind the work schedule causing reduction in progress rate, hence, delaying the project.
- To stop the work completely due to the delayed payment periods which is the most pessimistic solution of the problem.

3.2 FINANCING COSTS

As mentioned above, if the contractor chooses the first option, i.e. to locate additional funds to cover all the extra costs caused by delaying the periodic payment made by the client. It is clear that the contractor will be liable to additional interest costs for the extra funds provided to cover the shortfall. These extra costs reflect the increase in the financing costs to the contractor. These extra funds need to be quantified in term of an allowance as a percentage to be added to the estimated cost of the project. In this regard the contractor has to determine one of the following two alternatives:

- Add the allowance factor directly to the estimated project's cost, or
- Include it as a part of a claim resolution plan.

3.3 FINANCING SCHEMES

Most construction firms depend on financing support from banks, and the contractor is usually responsible to make decisions in the way to finance the construction projects. S/he has to choose whether to borrow the money from the bank or to adapt self-financing. In case of looking for bank support, the following information could be expected from the lender bank, (James M. Neil 82).

- Detailed examination of the firm's past record of performance.
- The quality of the firm's management group.
- The type of work engaged in, and
- The current financial situation

Bank financing can take the following forms:

- Line-of-credit
- Collateral loan
- Individual project loan

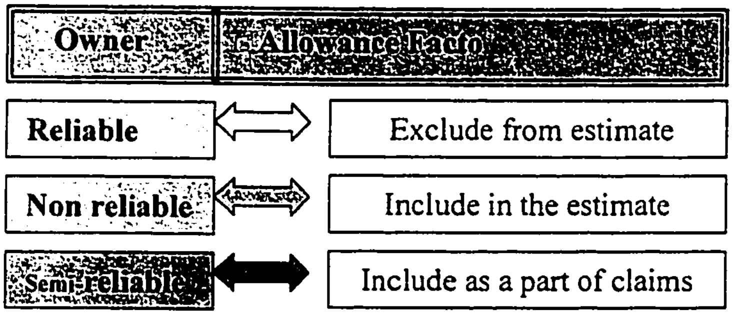
A construction company may require locating a **line of credit facility**. A line of credit is defined as an open charge account for specific period so that the contractor need not to go back to the bank each time the firm needs money for expenditure. It is a borrowing limit that the bank agreed to after a financial analysis of a firm (Neil 1982). The common construction systems available to the contractor within the construction industry are, construction loans, commercial loans, and overdraft (Awad, 1993).

After the contractor decides the way to finance the project, s/he has to choose whether to finance in full or in portion. This decision depends on the contractor's funds availability and desire. The repayment figure could be a defined repayment or a circumstantial repayment. In the case of defined repayment, the loan is to be drawn completely and the repayment is to be made in equal portions for a specified period, and in case of circumstantial, the interest would occur on the used portion of the loan only. This study will deal with the defined-full. It must be noted that the procedure, which will be taken within this study, could be also applied with the partial-financing portion and the circumstantial repayments exactly in the same way.

The next stage, before determining the added financing costs due to the delay in the contractor periodic payments by the client, is to incorporate risk adjustments as a range of possible values for each possible individual disrupted cash flow, for one and two consecutive periods within the contractor cash flow.

Having taken risk into consideration, the added financing cost is determined as an allowance and added to the bid price. This may reduce the contractor's level of competitiveness, therefore, the contractor has the option to include it in his estimate or not. It depends on the owner reliability as shown in figure (3.1).

Fig. 3.1 Owner reliability



3.4 IMPACT COSTS

The term Impact refers to the indirect delay or interference that a change on one phase of the work may create on another phase, and the costs of such delay or interference should be recognised as a consequential cost to be considered as a part of direct cost expenses of the contractor, and consideration must be given to allowing for payment of these costs to the contractor (Edward, 1997). Several factors can cause the impact (change order, delays, disruptions, acceleration, change in site conditions, labour disruption and weather), the incidence of one of these factors may cause a change in the contract price, schedule of payments, completion date or plan and specifications (Edward 1997).

Different methods have been suggested to evaluate and quantify impact costs. These methods can be grouped under three main categories as following:

- The Total Cost Method.
- The Differential Cost Method.
- The Estimating Method.

Awad (1993), indicated that the disruption causes a reduction in progress which results in impact costs being incurred, therefore the impact costs was used to quantify the consequence of the disruption. The author used the total cost method for the quantification of the impact costs. The same method is chosen to serve this study for two purposes. First, Differential cost and estimating methods as Awad mentioned requires data that only exists once a delay has happened. Secondly, it would be needed to use the same method for the purpose of the comparison, i.e. to get the same results that can help in the determination of the effect of incorporating risk. Table (3.1) shows the main equations that used to quantify the impact costs, the full details were explained by Awad (1993).

Table 3.1 Impact costs equations

METHODOLOGY	EQUATION USED
Index Value	$I = ((X_n - X_B) \times 100 / X_B) + 100$
The Increase in Remaining Project	$IR = ((P_D - Po) \times 100 / Po) + 100$
Percentage Increase in Remaining Duration	$P_R = (IR - 100) \times 100 / 100$
Effective Activity Duration	$A_E = Ao (1 - P_R)$
Overall Reduction in Critical Activity's Progress rate	$A_{RED} = Ao - A_E$
Activity Adjustment Duration	$Ao' = Wo \times MA_{RED}$
Activity Weight at Period i	$Wo = Ao / \sum_{i=m}^{n} Aoi; m \leq i \leq n$
Adjusted Original Activity Duration	$A^{*}o = Ao' + Ao$
Effective Progress Reduction on Remaining Duration	$E_{PR} = MA_{RED}/D_{RP} \times 100\ \%$
Effective Remaining Duration	$C_{RE} = IC$
Total Effective Project Cost	$C_{ET} = C_{ER} + C_{<MARED}$
Overall Impacted Costs	$C_P = (C_{ET} - C_{OT}) / N.C_{OT} \times 100\%$
Allowance Factor	$A_L = C_{OT} (C_F + C_P)$

3.5 DEVELOPING THE CURRENT MODEL

3.5.1 Methodology

In the construction projects normally the owner has to make scheduled payments over a specific period of time in order to enable the contractor to build that construction project. These scheduled payments are the contractor's cash flow. This chapter deals with a very specific point, that is the effect of delaying periodic payments made by client on the contractor's cash flow. As mentioned earlier it is the contractor's responsibility to take care of this effect and interruption. Whether to allocate extra funds, to be behind the schedule leading to reduction in progress rate, or to stop the work completely for the period of disruption. The last option will be ignored because of its effect on the contractor's credibility. Therefore, the main consequences are:

- Added financing costs.
- Reduction in progress rate.

A mathematical model is developed in this chapter to help the contractor reduce the unnecessary costs that may involve in the project. The model analyzes and quantifies the effect of delaying the periodic payments by the owner on the contractor's cash flow and work schedule, taking into consideration **Risk Factor.** The model will later add this factor as a percentage to the bid estimate in term of allowance. Incorporating risk factor is a major part of this research.

Different scenarios were run to determine the probabilities that the disruptions could happen in the contractor cash flow, and the risk adjustments were added as a range of possible values for each possible individual disrupted cash flow, for one and two periods throughout the project.

3.5.2 Current model

The basic requirements for this model as shown in figure (3.2), are:

First: Decide between a **construction** and **commercial** loan.

Second: Determine the maximum cash requirements **MCR.**

Third: Determine the **financing scheme**.

Fourth: Determine the estimated periodic cash requirements **PCR**

This study will deal with **Defined-Full** Financing Scheme. The model can be applied to all other financing schemes as well.

3.5.2.1 Loan Repayment

Interest can be defined as the cost of making funds available to use, and borrowing money means repaying an amount over time that includes interest and therefore is greater than the amount borrowed. Full financing is a hundred percent portioning, by means of the loan is equal the maximum cash requirement. In this case the contractor will calculate

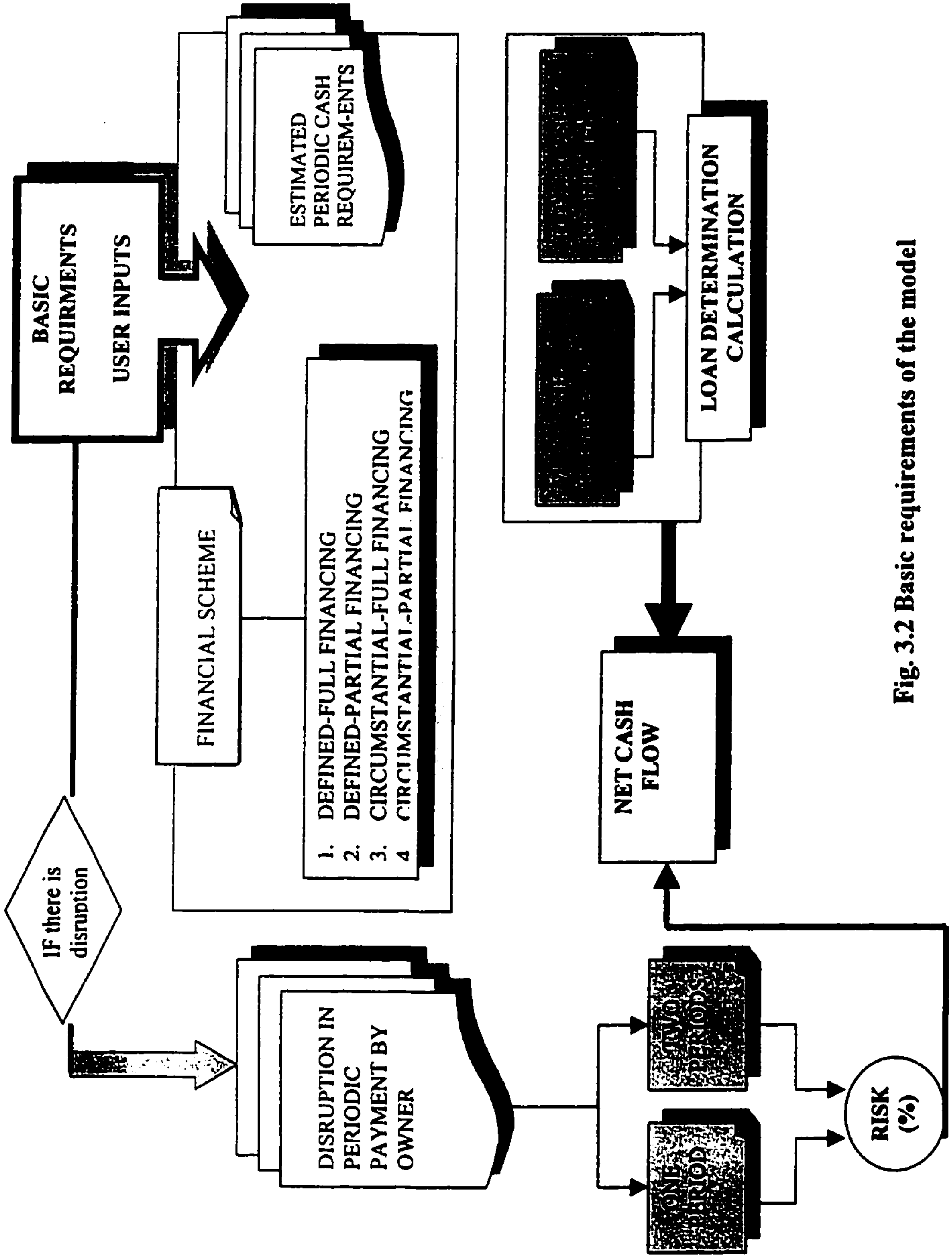


Fig. 3.2 Basic requirements of the model

the over all interest payment as a part of the loan. These payments were evaluated by using the following equation (Chan 1995). Figure (3.3).

[redacted] Equation ⟶ (1)

where:

- **AD** = Periodic Repayment Figure
- **P** = Loan Money Drawn
- **A/P** = Capital Recovery Factor

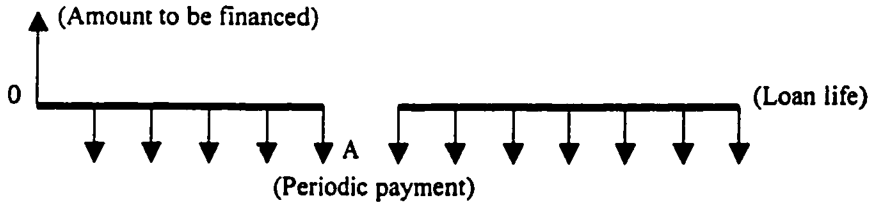


Fig. 3.3 Cash flow transaction

3.5.2.2 Earning Account

It is a common practice within the Canadian construction industry, once the contractor is granted the loan, it is expected that the loan will be deposited into an **Interest Earning Account**. This money earns interest, which can be calculated using the following standard equation:

[redacted]

When n= 1 $\qquad I_D = Di$

or

[redacted] $\qquad$ Equation → (2)

When n = 1 $\qquad I_D = Di$

where:

- $\mathbf{I_D}$ = Single Periodic Interest Earned from Deposit Account.
- **D** = Deposited Money to earn Interest.
- **(F/P i , n)** = Single Sum Future Worth Factor.

3.5.2.3 Net Cash Flow Model

Based on the previous calculations and what was mentioned in chapter (2.2.1), cash flow is equal to the actual movement of money into and out of the company. A net cash flow balance model was developed as shown in figure (3.4).

- Cash paid out is shown as a negative cash flow (-ve), and it includes the periodic cash requirement and periodic loan repayment amount.
- Money flowing into is shown as a positive cash flow (+ve). And it includes the interim payments made by client, and the interest earned from the deposit.
- For the period (2) the net cash flow is equal to the difference between the positive (+ve) and the negative (-ve) cash flow plus the Net cash flow for the preceding period (1) as shown in the following equation:

$$NCF_2 = (PI + ID) - (LRp) - (CRp) + NCF_1$$ Equation ⟶ (3)

Where:

- **NCF2** = Net Cash Flow balance for the current period.
- **NCF1** = Net Cash Flow balance for the preceding period.
- **PI** = Interim Payments received at the same period.
- **CRp** = Cash requirement for that period
- **LRp** = Periodic Loan repayment including interest and principal

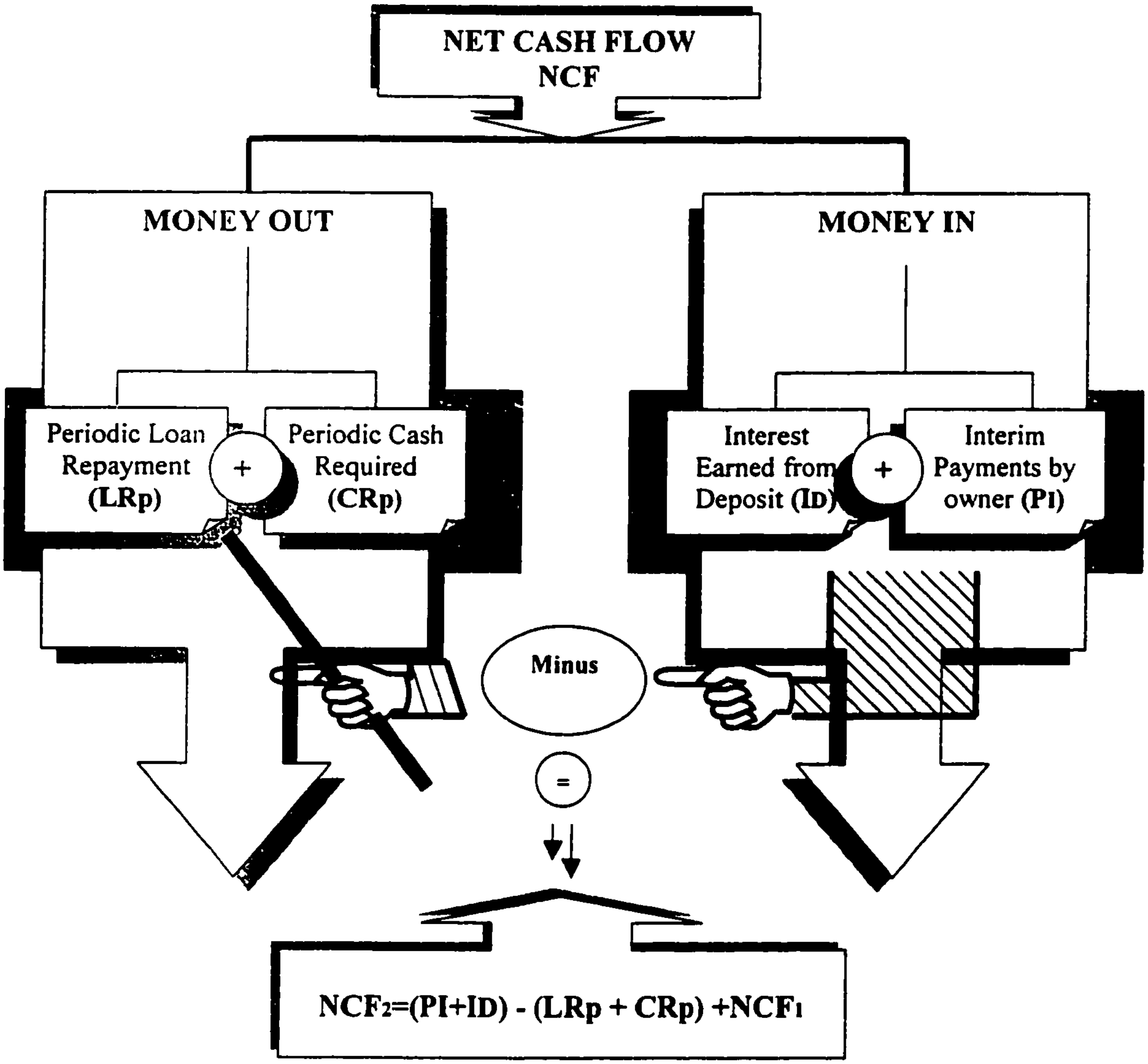


FIG. 3.4 Net Cash flow balance model

3.5.2.4 Added Financing Costs

According to the industry's professional's point of views, the worst situation could happen to the contractor's cash flow, when the client delays the periodic payments for two sequential periods. Most likely the contractor will not be able to continue the work and become more liable to bankruptcy. In the light of these experiences different scenarios were run using the developed model, where the periodic payments were disrupted for one and two periods, as well as the loan repayment for the same period that the disruption could happen taking into consideration the increased interest on the payment relocation. This study assumed that the worst scenario (two consecutive payments delay) would take place, and the contractor would continue working according to the original work schedule as well as the payments to the subcontractors, suppliers and labour be made for the work that has already been done. The worst scenario was chosen according to the maximum negative (-ve) cash required, and the maximum negative (-ve) interest earned from the deposit (I_D) was determined in order to calculate the added financing costs. The financing costs will be calculated as a percentage of the total cash requirements for the entire project, as indicated in the following equation:

$$AFC = (MID/CRT) \times 100\% \qquad \text{Equation} \longrightarrow (4)$$

Where:

- **AFC** = Added Financing Costs

- **MID** = Maximum Negative (-ve) Interest Earned from Deposit

- **CoT** = Total Cash Required For The Entire Project

3.5.2.5 Risk Adjustments

It can be difficult to prepare an accurate estimate of the contractor's cash flow. Most of the time the contractor can not determine whether the project will make or lose money. By incorporating risk as a range of possible values (probability) the accuracy and the level of certainty about the entire project will be more probable and reliable. The assignment of these probabilities is called a risk analysis.

As mentioned in chapter (2) there are different methods for risk analysis exist including the followings:

1. Expert
2. Historical databases
3. Risk model
4. Probabilistic distribution

These methods require data and enough experience, which is not available to the cases used within this study. Using the most common program "Excel", as a spreadsheet was used to perform many scenarios to determine the probability that the disruption could happen to the contractor's cash flow. Risk is added as range of possible values ranged between (0 to 100%) for each possible individual disrupted cash flow, for instance what will happen to the cash flow when the payments can be disrupted for one or two Consecutive periods throughout the project within a 50% certainty. For more accuracy Monte Carlo simulation could be used to determine the risk, based on known information about the client. This information includes, client's payment history, default payments, number of projects handled by the same client, client personnel experience, available funds and so forth.

Once the risk factor is determined the net cash flow equation will be adjusted as following:

$$NCF_2=((PI+ID)-(LRp+CRp)+NCF_1)\times\mu \qquad \text{Equation} \longrightarrow (5)$$

Where

- μ = The adjusted Risk Factor.

3.5.2.6 The Net Cash Flow Model

Figure (3.5) shows the net cash flow's flow-chart for the current model. The user is required to input the following requirement:

- Periodic cash required
- Total cash required
- Loan interest
- Earned interest

➡ If there is no disruption in the contractor's cash flow the model will go directly and calculates the net cash flow.

➡ If the client delayed the payments, the contractor or the user has to determine the period or periods that is disrupted.

➡ The next step that the model has to perform is to decide whether the contractor has to incorporate risks or not. If the answer is yes then it will add the percentage of risk.

➡ The model then will calculate the added financing costs as a percentage, which will finally be added to the contractor's bid estimate.

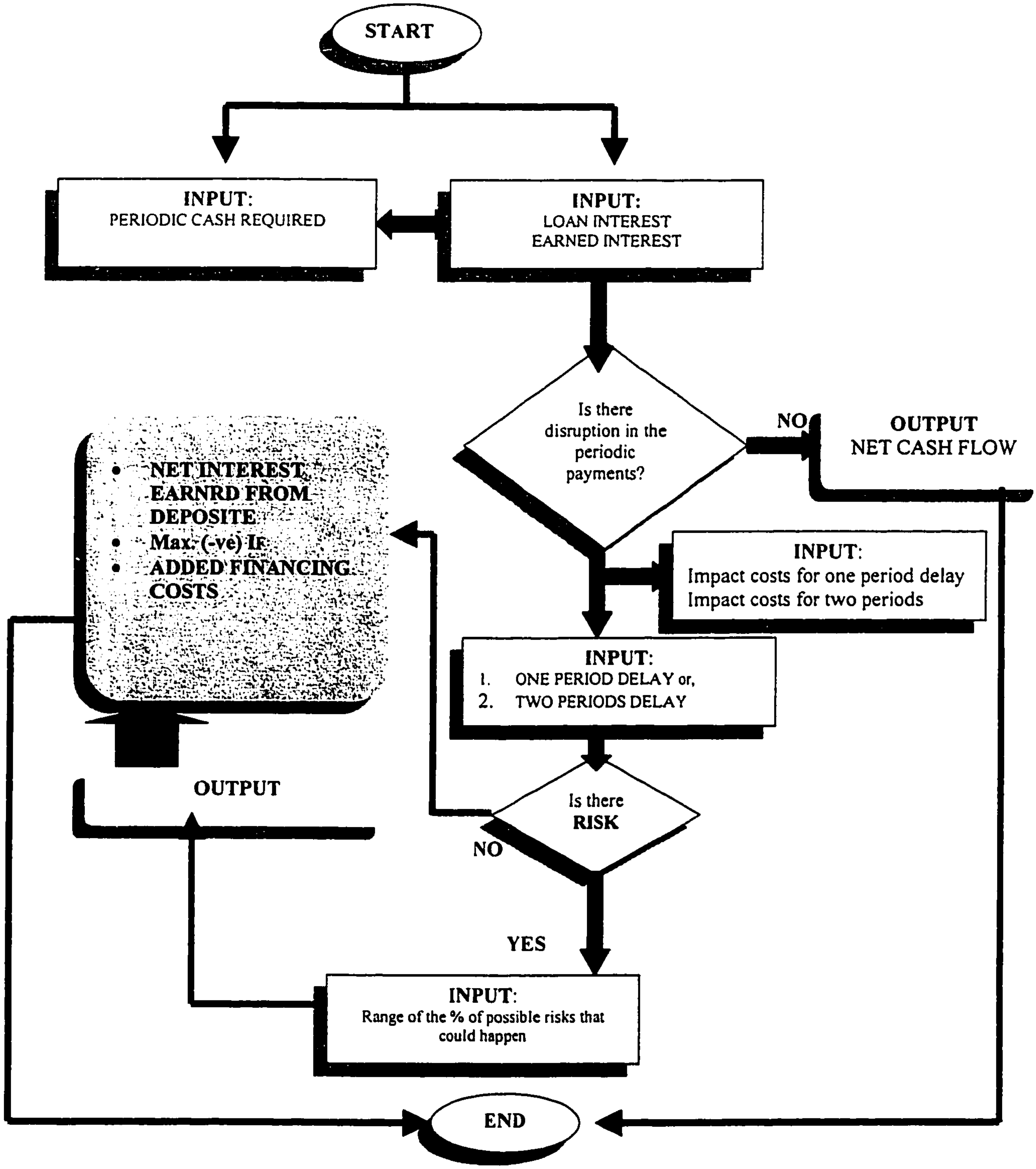


Fig. 3.5 Net cash flow chart

3.6 SUMMARY

This Chapter proposed an aided mathematical model that may help contractors to reduce the unnecessary costs that may involve in the project. The model analysed and quantified the effect of delaying the periodic payments by the owner on the contractor's cash flow and work schedule, taking into consideration **Risk Factor.** The risk consideration is a major part in this research. The model added this factor as a percentage to be included to the bid estimate in term of allowance. It should be mentioned that during the working with the existing model, several modifications have been carried out. These modifications will be discussed briefly in Chapter Six (Discussions of Results).

CHAPTER IV

CASE STUDIES

4.1 GENERAL

It is necessary to apply the developed model for the effect of the delay of the periodic payments made by client on the contractor's cash flow and project work schedule, taking into consideration risk factors, to different case studies, in order to examine the model's efficiency. Different case studies were established, the total costs of the projects ranged between $100,000 and $10 million. The financing portioning assumed to be full financing for limitation purposes.

4.2 THE CASE STUDY

The main case incorporated in this study is a documented case (Cooke et al, 1986). This case was chosen for its suitability for the developed model. It is necessary to mention that this model can be applied to any size of projects. The case represents a medium sized project. The contractor estimated the total cost for the entire project at approximately **$ 2.1 million** with project life **of one year** (12 months). The project consists of nine activities, table 4.1 describes the activities, duration, cost of each activity, while table 4.2 identifies the estimated periodic cash requirement by the contractor. This based on the monetary and duration bar chart as provided in the as-planned scheduled figure 4.1.A, 4.1.B

Fig. 4.1.A- Costs performing the work in particular month

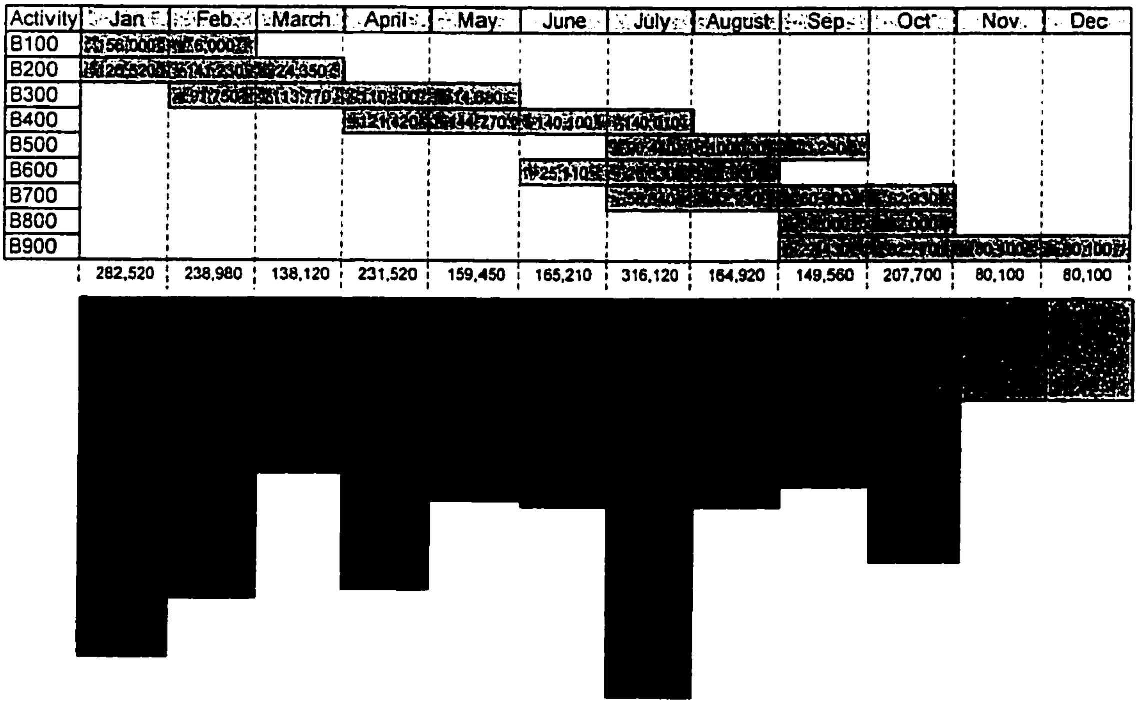


Fig. 4.1.B- Monetary and duration bar chart for the sample case study

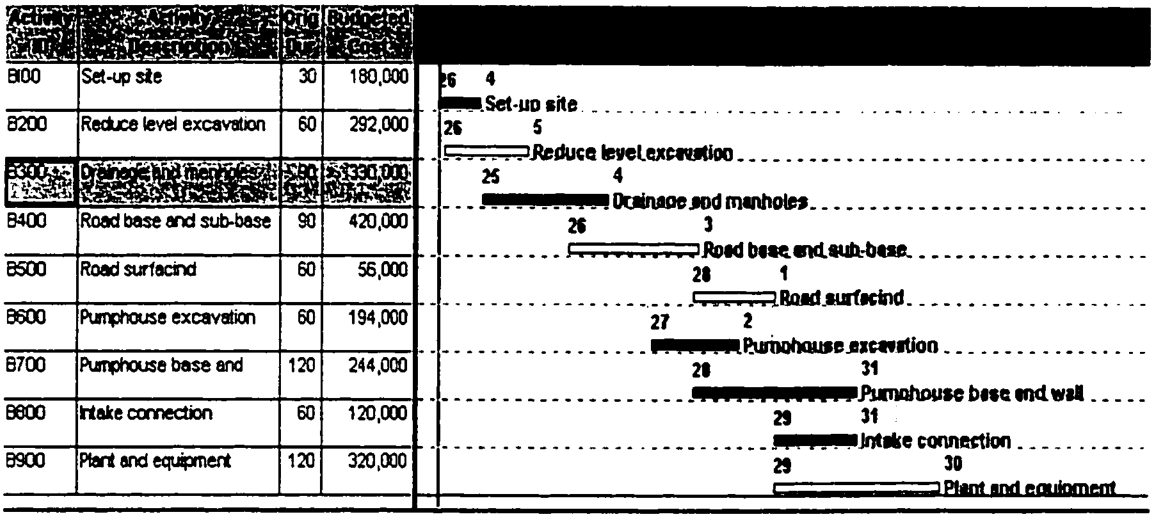


Table 4.1.C- Summary of project activities

Activity ID	Description	Duration	cost ($)
B100	Set-up site	30	180,000
B200	Reduce level excavation	60	292,000
B300	Drainage and manholes	90	330,000
B400	Road base and sub-base	90	420,000
B500	Road surfacing	60	194,000
B600	Pumphouse excavation	60	56,000
B700	Pumphouse base and walls	120	244,000
B800	Intake connections	60	120,000
B900	Plant and equipment	120	320,000

Table 4.2 Estimated periodic cash requirement

[redacted]	Periodic Cash Requirement ($)
[redacted]	282 620
[redacted]	238 980
[redacted]	138 120
[redacted]	231 520
[redacted]	159 450
[redacted]	165 210
[redacted]	190 120
[redacted]	164 920
[redacted]	199 560
[redacted]	207 700
[redacted]	80 100
[redacted]	80 100
Total	[redacted]

4.2.1 Case Study Framework

The main aim of conducting this study is to analyse the effect of delaying the periodic payments made by client on the contractor's cash flow, and quantifying the consequences in term of an allowance, as a percentage within the contractor's bid estimate. In the light of the above provided information, a cash flow table is established as shown in figure 4.3. The contractor input the estimated periodic cash requirements (**CRp**) in order to derive the total cash required as well as the maximum cash required. Due to the current practices in today's industry, the contractor normally receives the periodic interim payments (**Pi**) at the end of each period, therefore the maximum cash required is obtained as a loan from a financial institution as a line of credit. For the periodic loan repayments (**LRp**) and the earned interest (**ID**), the contractor should provide the following information:

- Loan interest = 9% per annum, = 0.75% per month,
- Deposit interest = 6% per annum = 0.50% per month, and
- Project life = one year (12 months).

- **Loan calculations:**

- Loan (P)= Max cash required = 282620
- I =0.75% per month
- A/P(.75%,12) = 0.0875

- LRp = P(A/P i , n) = 282620(0.0875)

  LRp = 24716

- **Earned interest Calculation (ID):**

  Deposit interest = 0.50% per month

  P(F/P i , n) = p (F/P 0.50,n) n= 1,2,3,........,12)

  P = previous balance

The above calculations the net cash flow are established.

Table 4.3 - Contractor Cash Flow

[illegible]	CRp	R	LRp	pi	Dep Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520	with No risk	24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		24,729	199,560	(148,216)	(741)	(148,958)	(264,170)
11	80,100		24,729	207,700	(46,087)	(230)	(46,317)	(310,487)
12	80,100		24,729	80,100	(71,046)	(355)	(71,402)	(381,889)
13			24,729	80,100	(16,031)	(80)	(16,111)	(398,000)
	2.138.400					(1.980)		

4.2.1.1 Cash Flow Disruptions

Having the cash flow established the contractor should then disrupt the interim payments made by the owner for one and two consecutive periods. Therefore, different scenarios of periodic payments disruptions are established. As a result of disruptions, the periodic loan repayment for the succeeded period is modified as following:

- **Loan disruption** = F (P/F I , n)

  = F(P/F 0.75%,1)

  = 24716 (1.0075) = 24729

Table 4.4 shows an example of the disruption procedure, where the disruption occurred in the first payment. When the disruption happened the contractor should take the amount of money where the disruption happened as a loan, as a result this will be added to the CRp for the succeeded period

The periodic loan repayment for the succeeded period (LRp2):

=Periodic loan repayment + Loan disruption + (CRp2 x Loan interest - cash flow for the proceeded period)

= 24716 + 24901+ 238980 x 0 .75% - 0

= 51409

The complete run for the periodic payments disruptions are presented in Appendix A.

Table 4.4 - Disruptions in the Owner's Interim Payments

	CRp	R	LRp	[illegible]	Dep.Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980				(238,980)	(1,195)	(240,175)	(240,175)
3	138,120		51,436	521,600	91,869	459	92,328	(147,847)
4	231,520		24,729	138,120	(25,801)	(129)	(25,930)	(173,777)
5	159,450	with No risk	24,729	231,520	21,411	107	21,518	(152,259)
6	165,210		24,729	159,450	(8,972)	(45)	(9,016)	(161,276)
7	190,120		24,729	165,210	(58,656)	(293)	(58,949)	(220,225)
8	164,920		24,729	190,120	(58,478)	(292)	(58,771)	(278,995)
9	199,560		24,729	164,920	(118,140)	(591)	(118,731)	(397,726)
10	207,700		24,729	199,560	(151,600)	(758)	(152,358)	(550,084)
11	80,100		24,729	207,700	(49,487)	(247)	(49,734)	(599,818)
12	80,100		24,729	80,100	(74,464)	(372)	(74,836)	(674,654)
13			24,729	80,100	(19,465)	(97)	(19,563)	(694,217)
	2,138,400					(3,454)		

4.2.1.2 Risk Adjustments

The risk factors were added as a range of possible values for each possible individual disrupted cash flow, for one and two consecutive periods throughout the project. Table (4.5) shows an example of one possibility where the disruption happened in the first payment with risk factor 30%. The complete run for these simulations are presented in Appendix B.

4.2.1.3 Added Financing Costs

The added financing cost were calculated for this case by taking the maximum earned interest for all the probabilities for one and two disruptions and by applying equation (4), as illustrated in chapter (3). For comparison purposes the risk factor assumed to be 20%

Table 4.5- Cash Flow Disruptions with Risks

	CRp	R	Rp	p	Dep.Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	**238,980**				**(238,980)**	(1,195)	**(240,175)**	**(240,175)**
3	138,120		32,741	521,600	110,564	553	111,117	(129,058)
4	231,520	Risk 30%	24,729	138,120	(7,013)	(35)	(7,048)	(136,106)
5	159,450		24,729	231,520	40,293	201	40,494	(95,612)
6	165,210		24,729	159,450	10,005	50	10,055	(85,556)
7	190,120		24,729	165,210	(39,584)	(198)	(39,782)	(125,338)
8	164,920		24,729	190,120	(39,311)	(197)	(39,508)	(164,846)
9	199,560		24,729	164,920	(98,877)	(494)	(99,371)	(264,218)
10	207,700		24,729	199,560	(132,241)	(661)	(132,902)	(397,119)
11	80,100		24,729	207,700	(30,031)	(150)	(30,181)	(427,301)
12	80,100		24,729	80,100	(54,910)	(275)	(55,185)	(482,486)
13			24,729	80,100	186	1	187	(482,299)
	2.138.400			·		(2.399)		

4.2.1.4 The Impact Costs

The impact costs were calculated as mentioned in chapter (3) and added to the added financing costs in order to obtain the desired allowance factor which will be finally added to the contractor bid estimate as a percentage.

4.2.2 The Model Application

To simplify the processes, the established model has applied to different case studies with different probabilities of disrupting the interim payments that made by owner as well as incorporating different risk factors. Net cash flow model is established using Excel 97. The main contents of this model could be divided into two main parts as following:

INPUTS: Figure 4.2-A, B, and C show screen printout for the user's main inputs for cash flow and work schedule, which are:

1 Project duration

2 Loan Interest

3 Deposit Interest

4 Risk Factor

5 Periodic Cash Required

- **OUTPUTS**: Figure 4.3 shows the out puts

1 Contractor's cash flow with no disruptions, as it shown in figure 4.3 – A

2 Contractor's disrupted cash flow as it shown in figure 4.3 – B

3 Contractor's cash flow diagram as shown in figure 4.3 - C

4 The Allowance Factor which will be added in the contractor's bid estimate Figure 4.3 - D

Fig. 4.2-A- User's main inputs

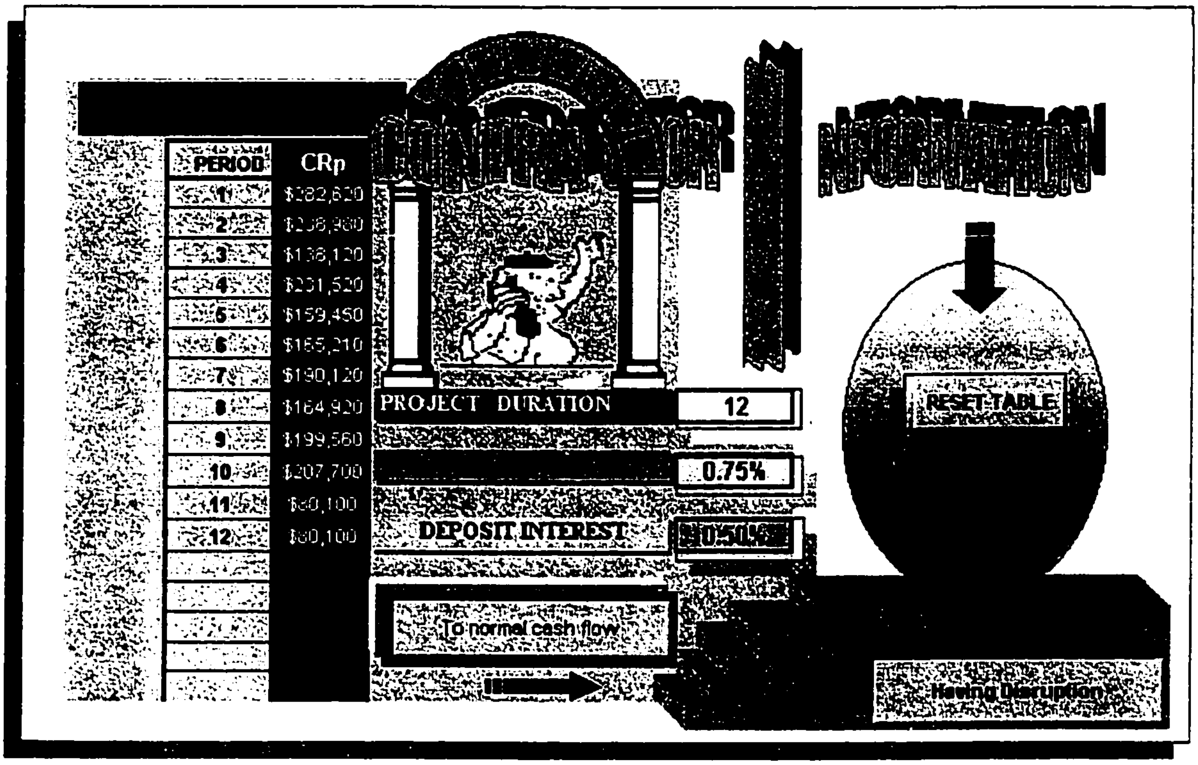


Fig. 4.2-B- User's main inputs delay assigning

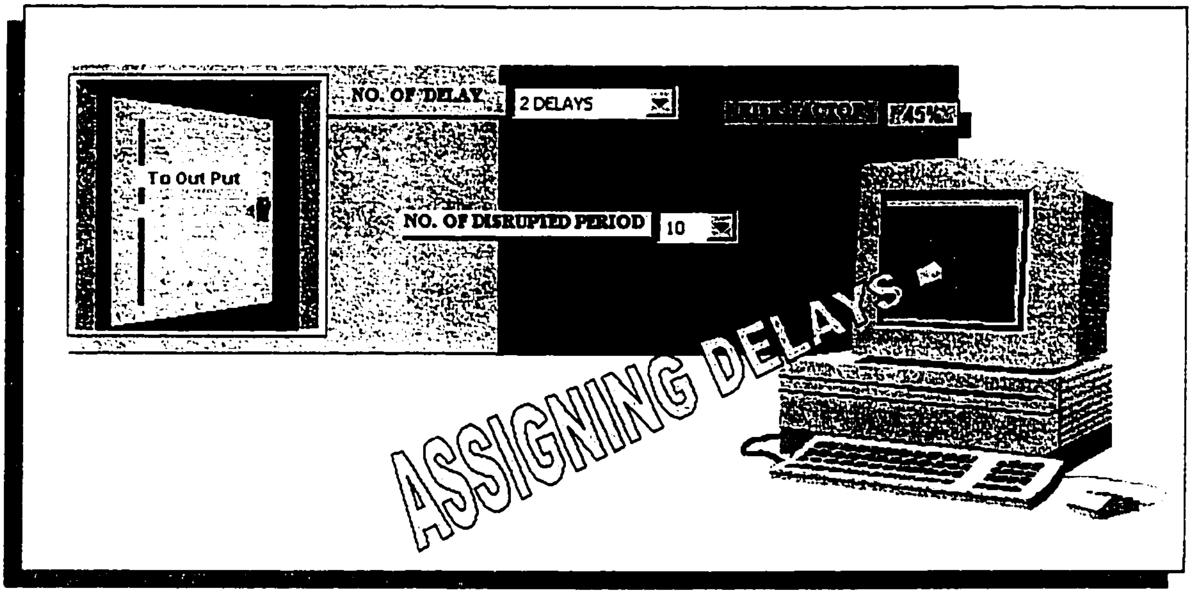
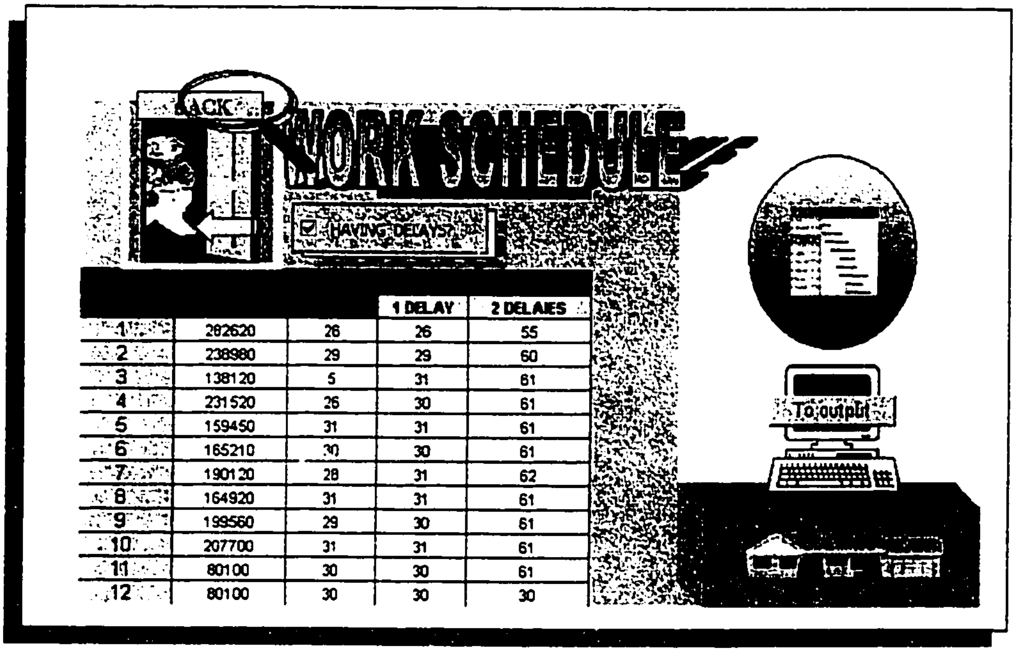


Fig. 4.2-C- User's main inputs for work schedule



			1 DELAY	2 DELAIES
1	282620	26	26	55
2	238980	29	29	60
3	138120	5	31	61
4	231520	26	30	61
5	159450	31	31	61
6	165210	30	30	61
7	190120	28	31	62
8	164920	31	31	61
9	199560	29	30	61
10	207700	31	31	61
11	80100	30	30	61
12	80100	30	30	30

Fig. 4.3-A-Contractor's cash flow with no disruptions

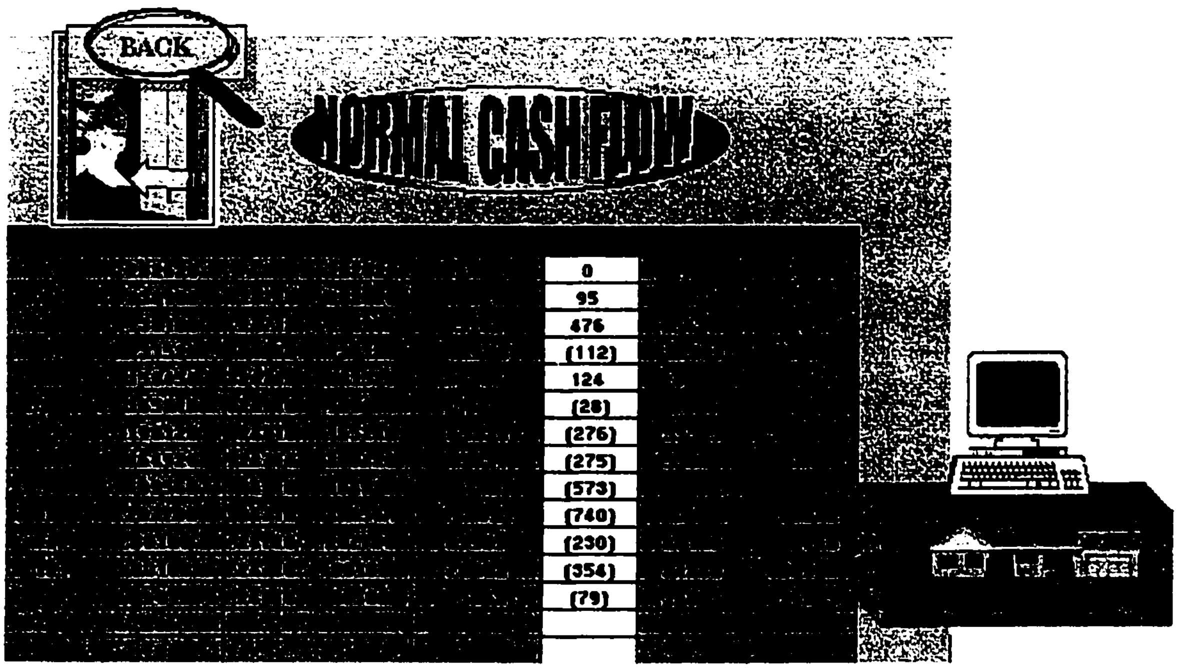


Fig 4.3-B- Contractor's disrupted cash flow

Period	CRp	R	CRp	pi	Dep.Bal	ID	NCF	CCF
						$0		
						$95		
						$476		
						($112)		
						$124		
						($28)		
7	$190,120	[illegible]	0	$0	($195,734)	($979)	($196,712)	($85,366)
8	$164,920	[illegible]	0	$0	($361,632)	($1,808)	($363,441)	($448,807)
						($520)		
						($687)		
						($176)		
						($300)		
						($25)		

Fig.4.3-C -Contractor's Out Put Diagram

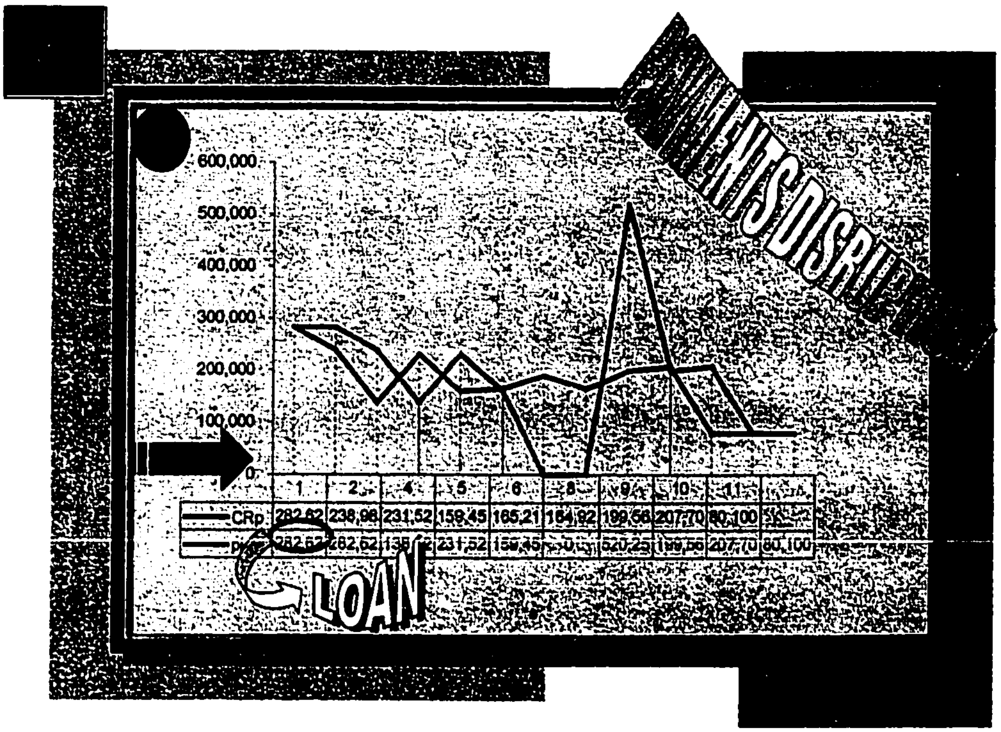
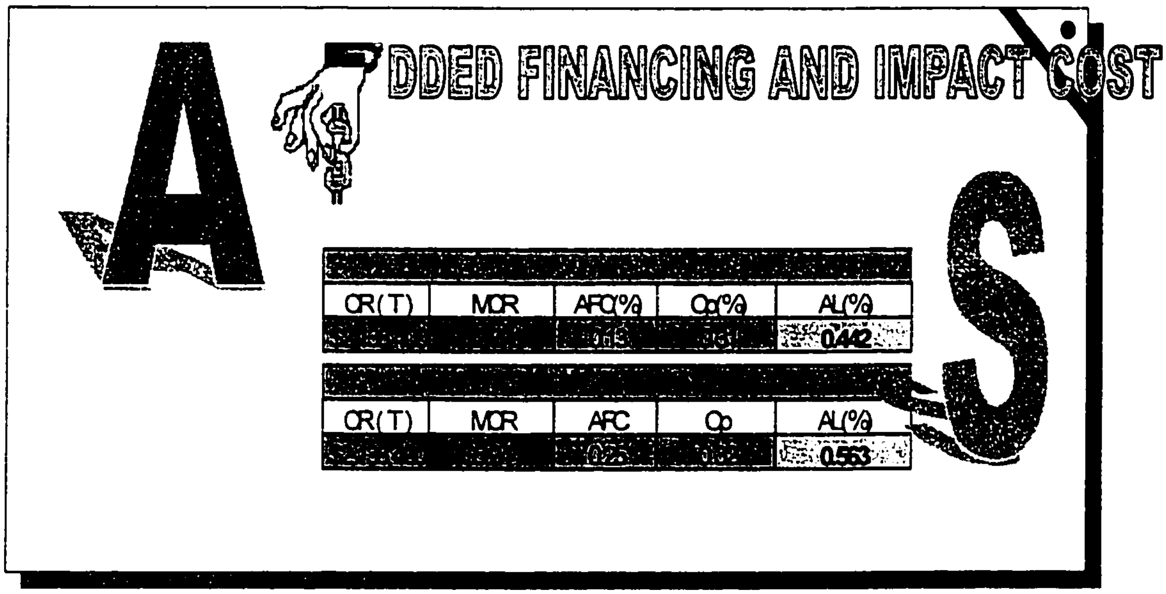


Fig 4.3- D-Contractor's Out Put Allowance Factor



CHAPTER V

DISSCUSION OF THE RESULTS

5.1 INTRODUCTION

Contractors usually relay on owner's periodic payments to run their projects. Indeed they prepare their projects cash flow based on these payments. Any delays in these payments might disrupt or delay the project. In cases like these, the contractor will bear the risk associated with these delayed payments. Risk in a construction project, however, can not be eliminated, but can be minimised or transferred from one party to another (Roozbeh, 1995). Perfect safety is impossible. However, Systematic risk, while difficult to anticipate and impossible to eliminate, can be reasonably controlled with proper risk evaluation and planning (Hollis et al. 1992). Therefore planning and preparing for the possible coming troubles that could cause delay in the construction projects, specifically, contractor's cash flow and owner's delayed periodic interim payments problems are necessary. This chapter discusses the results of implementing the proposed model, in calculating the amount of risk that the contractor should add to his/her mark-up.

5.2 THE RESULTS

The theories that are applied in this study can be used for any kind and size of a construction project. However, the model being a prototype, has some limits. It is designed to handle projects with not more than thirty period's duration. However the model can be easily modified to deal with projects with higher duration.

The allowance factor for two period's disruptions, which is the worst scenario that the contractor could face, will be chosen to be included in the bid mark-up. In such a case, this will eventually minimize delays and a void the unnecessary extra costs to the project, that normally are associated with such delay, should the contractor face interim payments disruptions.

Referring to the previous chapter, the results of implementing the mentioned theories are shown in Table 5.1, and 5.2. Where Table 5.1 summaries the Added Financing Costs (**AFC**) for one and two periods disruptions with incorporating risk factors varying from 0 % to 100%, and Table 5.2 shows the Impact Costs (**Cp**), while Table 5.3 and Figure 5.1 identify the Allowance Factor (**AL**) for these disruptions. These results are driven from the model out put Chapter (4), figure 4.2-A, B and C.

At this stage the contractor can add the allowance factor (AL) to the mark-up value to be included in the bid price for submission to the owner.

Table 5.1 Added financing costs (AFC)

RISK (%)	Added financing costs (%)	
	1 - Disruption	2 - Disruptions
0	0.124	**0.213**
10	0.125	**0.220**
20	0.126	**0.228**
30	0.128	**0.235**
40	0.129	**0.242**
50	0.130	**0.249**
60	0.133	**0.256**
70	0.140	**0.263**
80	0.147	**0.270**
90	0.154	**0.277**
100	0.161	**0.284**

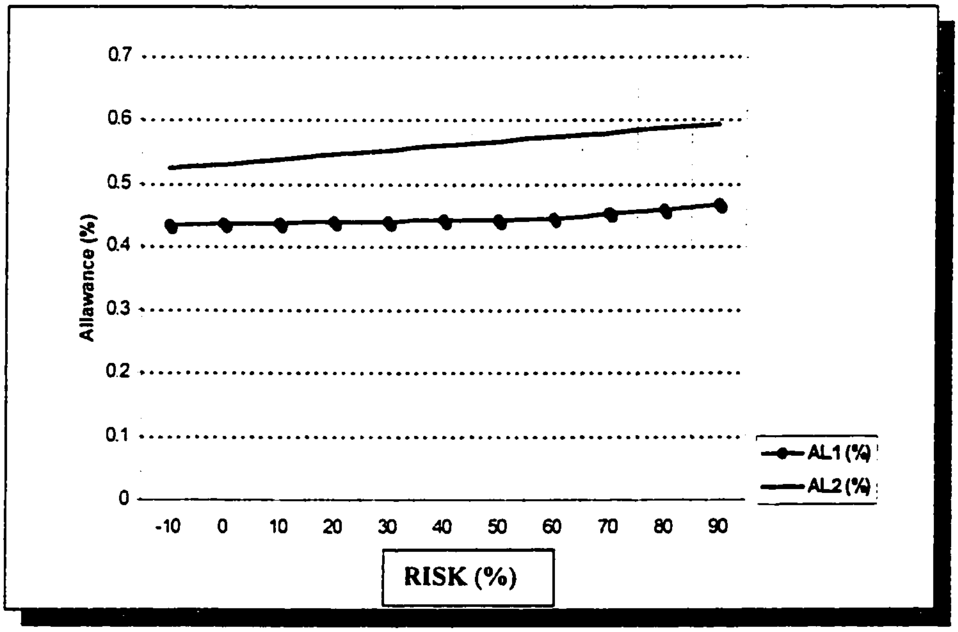
Table 5.2 - Impact costs (pc)

Number of Disruptions	Cp(%)
1	0.312
2	**0.317**

Table 5.3- The allowance factor with incorporating risks

Risk (%)	AL1 (%)	AL2 (%)
0	0.436	0.531
10	0.437	0.538
20	0.439	0.545
30	0.44	0.552
40	0.441	0.559
50	0.442	0.566
60	0.445	0.573
70	0.452	0.58
80	0.459	0.587
90	0.466	0.594

Figure 5.1 - Allowance factor diagram



5.3 DISCUSSION OF THE RESULTS

It had been noticed while studying the existing model, which had been established by Awad (1993), that modifications need be carried out.

First, the Net Cash Flow balance model (NCF) was established based on the difference between the earning and the expenses, the earning included each of the Interim Payments required from an owner, and the Interest earned from depositing the loaned money into an earning account.

This assumption was adjusted, so the cash flow for each successor period need to take the predecessor cash flow into consideration, i.e. to include it within the net cash flow calculations. Based on that the net cash flow equation has been modified to be as described in Chapter. (3) equation No. (3)

Second, for the Periodic Loan Repayments (LRp), In practice, when the disruption of the periodic payments take a place, the contractor takes the disrupted amount as a loan from the bank to be repaid directly when the owner release the next payment (the payment which is delayed), in order not to delay the wok schedule. This was ignored in the existing model. In the current model, the periodically loan repayments that the contractor tend to take at the beginning, plus the loan for the disrupted period, have been taken into consideration.

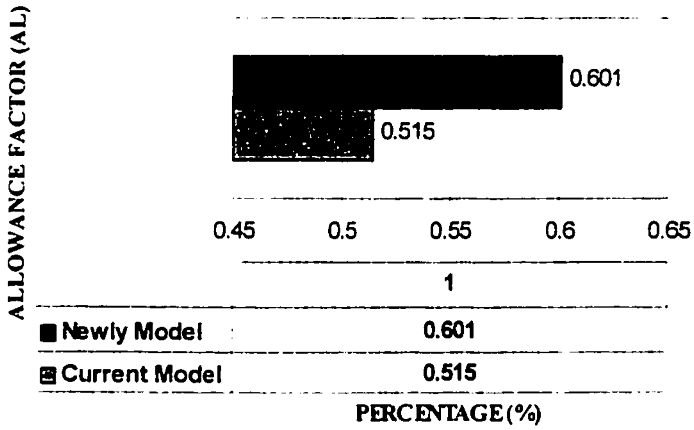
Third, the maximum negative cash required for the Added financing Costs calculations, is driven from the maximum negative cumulative cash flow, whereas it need to be driven from the maximum negative **I**nterest earned from **D**eposit account (**ID**). It reflects the actual amount of money that the contractor will earn or lose.

The current model takes these changes into consideration, and the case study was run based on all the above mentioned modifications. At this point it becomes difficult to compare the results of incorporating Risk for the current model with the existing one. Based on that the comparisons are done according to the followings:

- The comparison between the result of the existing and the current model had been made before incorporating the risk factor.
- A comparison between the cash flow model results before and after incorporating risks had been done for the current model only.

Under the defined full financing scheme Awad (1993), determined that the Contractor might include an allowance of 0.515 % of the total project cost. According to the current model, and as a result of the modifications that have been done, the Allowance factor determined to be 0.601%. Figure (5.2) Shows the comparison between the current and the new model.

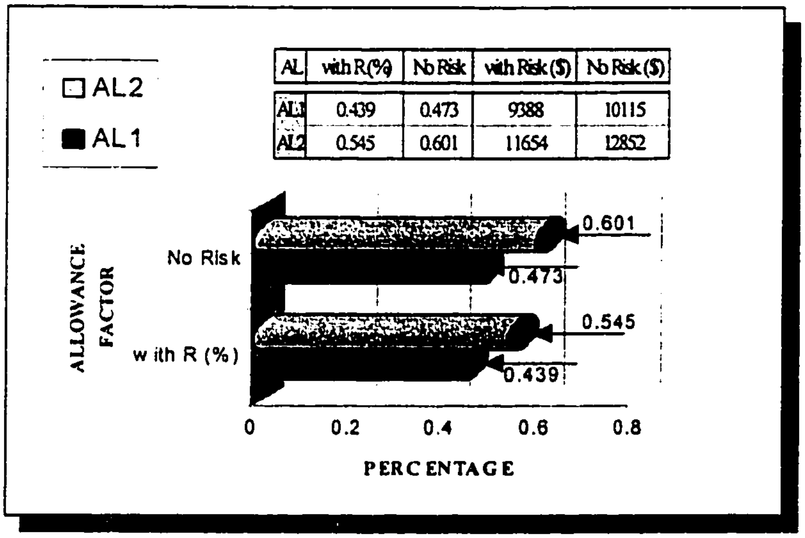
Fig. 5.2 A Comparison between the current and the new model.



Assuming that the risk is 20%, the contractor might include an allowance of 0.559% of the total project cost by adapting the defined full financing scheme for the new model, while without risk adjustments, s/he may include an allowance of 0.601% of the total project cost. It can be seen that the allowance factor will be reduced from 0.601% to 0.559%, as shown in figure (5.3). Therefore the owner would be charged a net payable interest sum of $9,943 with 20% risk instead of $11,954 without incorporating risk. In addition this will increase the contractor chances in wining the bid.

It can be seen from the figure 5.1 that the greater risk is the higher allowance factor will be. Once the risks are defined and quantified, the chances of maintaining a cash flow and minimizing extra costs can be improved.

Fig. 5.3 Alloawnce Factor (AL) with and with out risk



CHAPTER VI

CONCLUSION

6.1 Conclusion

Construction delays are difficult to be avoided during the construction life of a project. To scale down these delays, a great attention needs to be paid to the factors that cause delay. Literature review revealed that owner's payments tend to be one of the most important reasons that cause delays in the construction industry.

Most of the delay analysis techniques are used when the delay actually happened. Thus, contractor need to be protected against such problems that may occur because of the delay of the owner's periodic payments, however, this type of delay affect the contractor's cash flow and work schedule, i.e. extra monetary or/and time wise involvement.

The mathematical model described in this research tends to help the contractor during the bidding stage of the construction project to cast down the unnecessary extra costs caused by the delay of the periodic interim payments made by an owner. Moreover, predicting the amount of risk associated with the total cost of an activity is a major concern of this research

The added financing costs and the impact costs are the main problems that the contractor may face due to the owner's interim payment disruption. The developed model attempted to quantify these two main problems as an allowance percentage including the amount of risk associated with it. Based on the owner reliability, the contractor has the choice to include it directly in the bid estimate or as this may reduce the contractor's level of competitiveness, therefore, the contractor may include it as a part of claims resolution plan.

The distinct advantages of the developed model are:

1. Contractors may use this model during the bidding stage as an aid to predict and minimize the effect of possible unforeseen problems that may occur in the future.

2. The model is built based on a mathematical approach to quantify uncertainties related to the delay of owner's payments. In addition it is easy to use.

3. The model is capable of calculating the amount of risk as a percentage of the total cost of an activity to be taken into consideration by a contractor during the bidding stage of a project given owners reputation.

6.2 Recommendation for Further Research

Presently the model has been tested on small and medium sized projects. Further study need to be carried out in order to verify the applicability of the developed model to large size projects (cases).

Also, a further research can be undertaken for finding a possible way to link the model with scheduling software, management systems, and simulation in order to obtain the updated scheduled payment, and assign any delays to the work schedule directly.

In addition, other uncertainties need to be investigated, such as cost overruns, change orders, and inflation.

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APPENDIX A
PERIODIC PAYMENTS DISRUPTIONS

The contractor inputs the estimated periodic cash required (**CRp**) as following:

CRp

1	282620	4	231520	7	190120	10	207700
2	238980	5	159450	8	164920	11	80100
3	138120	6	165210	9	199560	12	80100

The Contractor is prompted to choose the financial scheme that s/he wishes to quantify. The defined full financing scheme is used in this case.

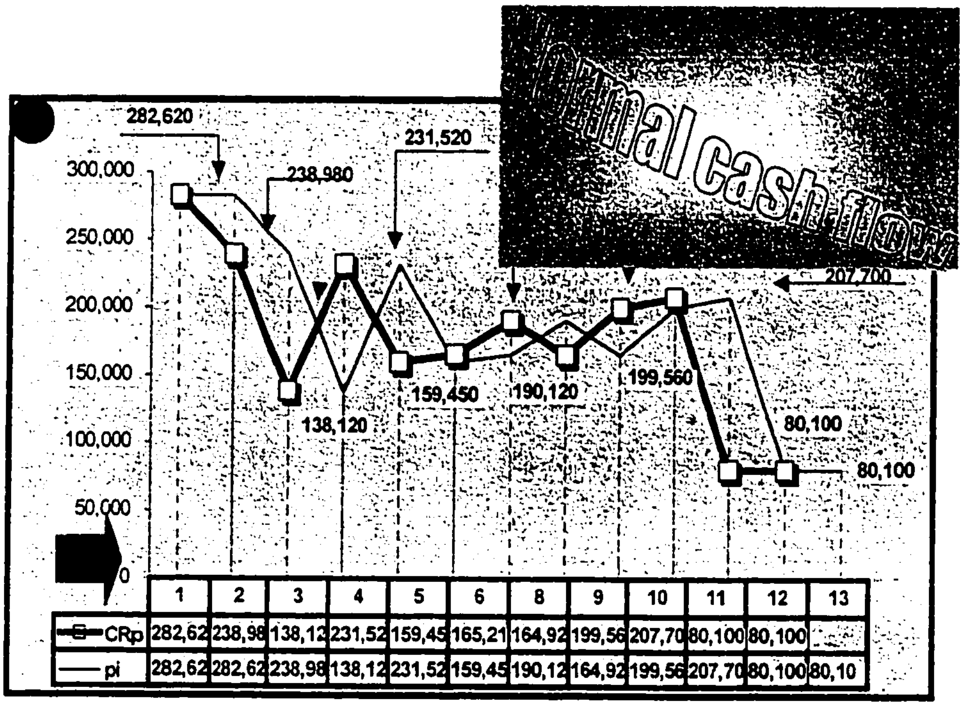
The contractor shall input the following information:

Loan Interest	=	9% per annum = 0.75 % per month
Deposit Interest	=	6% per annum = 0.50% per month
Project Duration	=	12 months

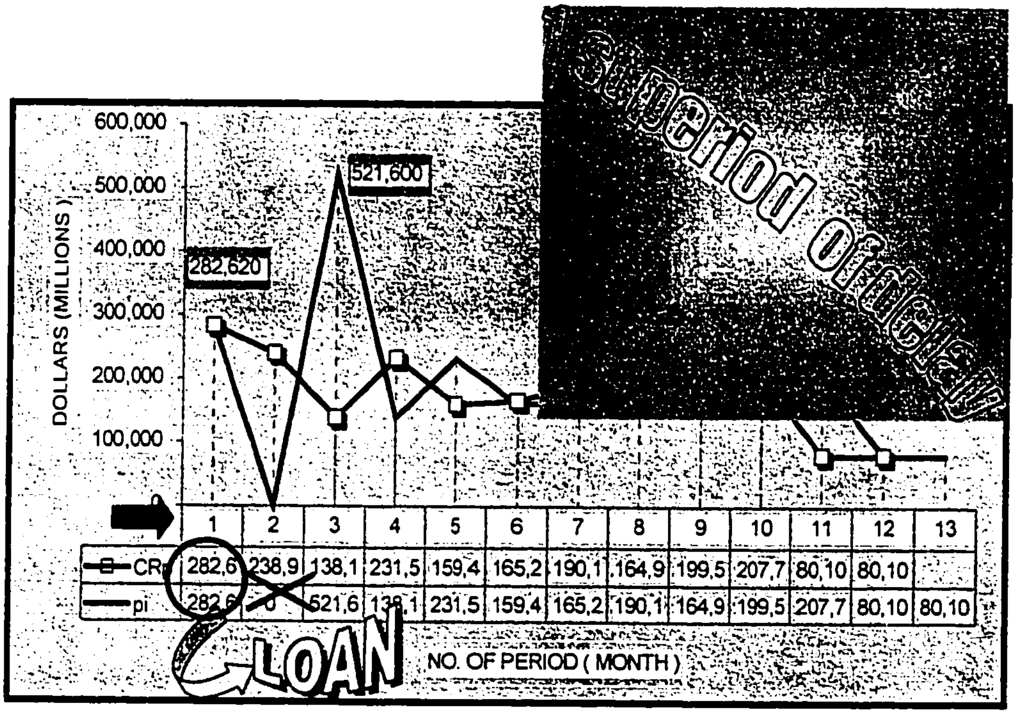
The payment disruptions are performed for one and two consecutive payment periods for the established project cash flow

A-1 ONE PERIOD DELAY

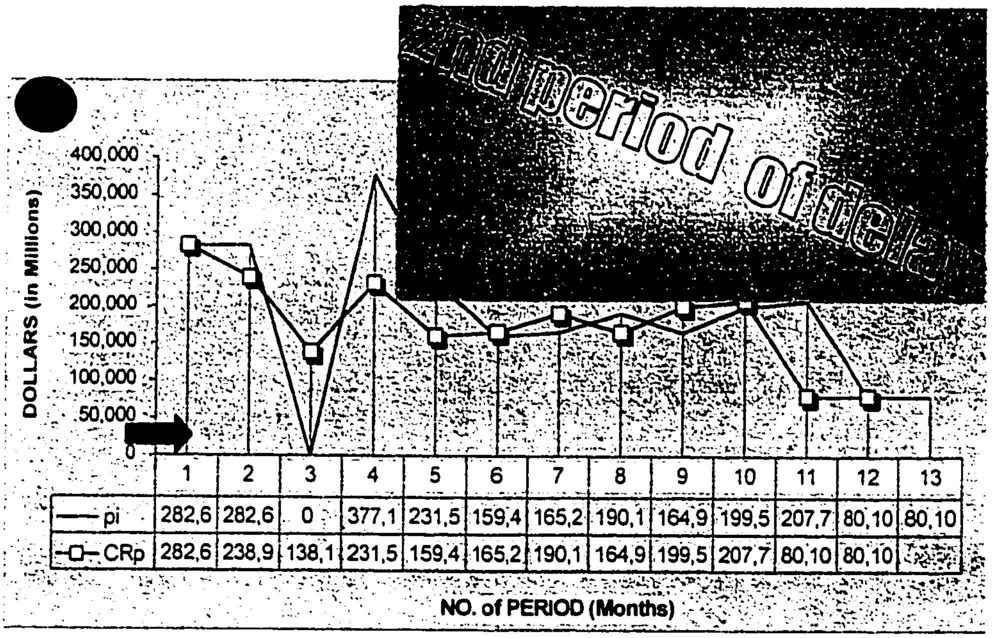
[illegible]	CRp	R	LRp	pi	Dep Bal	ID	NCR	CCR
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520	with No risk	24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		24,729	199,560	(148,216)	(741)	(148,958)	(264,170)
11	80,100		24,729	207,700	(46,087)	(230)	(46,317)	(310,487)
12	80,100		24,729	80,100	(71,046)	(355)	(71,402)	(381,889)
13			24,729	80,100	(16,031)	(80)	(16,111)	(398,000)
	2,138,400					(1,980)		



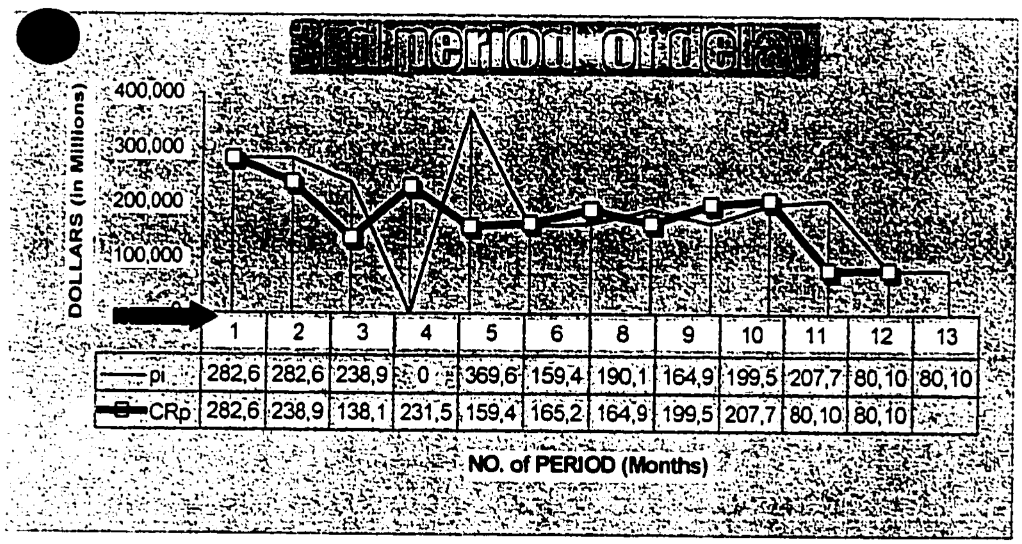
[illegible]	CRp	R	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	**238,980**		0	0	**(238,980)**	(1,195)	**(240,175)**	**(240,175)**
3	138,120		51,436	521,600	91,869	459	92,328	(147,847)
4	231,520	with No risk	24,729	138,120	(25,801)	(129)	(25,930)	(173,777)
5	159,450		24,729	231,520	21,411	107	21,518	(152,259)
6	165,210		24,729	159,450	(8,972)	(45)	(9,016)	(161,276)
7	190,120		24,729	165,210	(58,656)	(293)	(58,949)	(220,225)
8	164,920		24,729	190,120	(58,478)	(292)	(58,771)	(278,995)
9	199,560		24,729	164,920	(118,140)	(591)	(118,731)	(397,726)
10	207,700		24,729	199,560	(151,600)	(758)	(152,358)	(550,084)
11	80,100		24,729	207,700	(49,487)	(247)	(49,734)	(599,818)
12	80,100		24,729	80,100	(74,464)	(372)	(74,836)	(674,654)
13			24,729	80,100	(19,465)	(97)	(19,563)	**(694,217)**
	2,138,400					(3,454)		



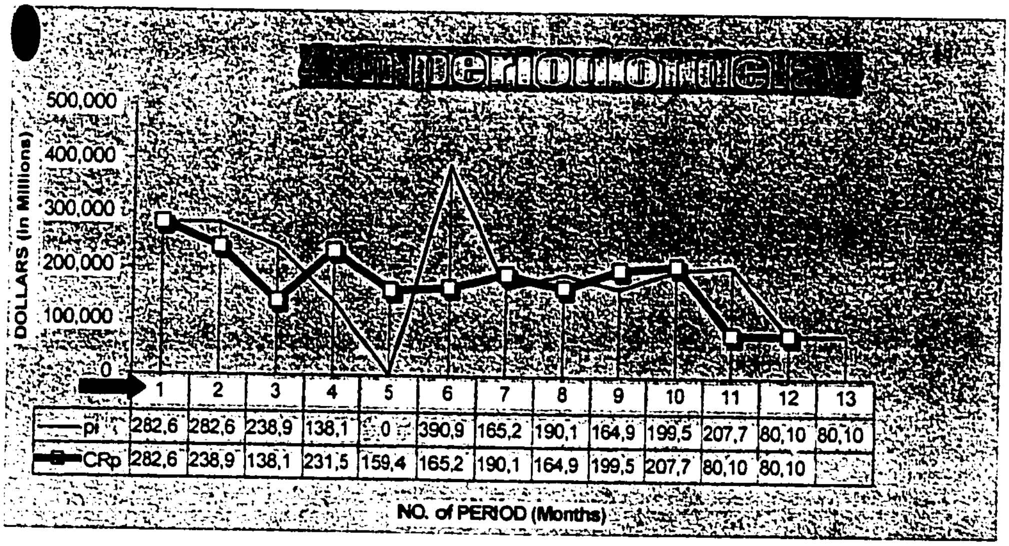
	CRp	R	LRp	[illegible]	Dep.Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	**138,120**		0	0	(119,115)	(596)	(119,710)	**(100,705)**
4	231,520		50,537	377,100	(24,668)	(123)	(24,791)	(125,496)
5	159,450	with No risk	24,729	231,520	22,550	113	22,663	(102,833)
6	165,210		24,729	159,450	(7,827)	(39)	(7,866)	(110,699)
7	190,120		24,729	165,210	(57,505)	(288)	(57,793)	(168,492)
8	164,920		24,729	190,120	(57,322)	(287)	(57,608)	(226,100)
9	199,560		24,729	164,920	(116,978)	(585)	(117,563)	(343,663)
10	207,700		24,729	199,560	(150,432)	(752)	(151,184)	(494,847)
11	80,100		24,729	207,700	(48,313)	(242)	(48,555)	(543,402)
12	80,100		24,729	80,100	(73,284)	(366)	(73,650)	(617,052)
13			24,729	80,100	(18,280)	(91)	(18,371)	(635,423)
	2,138,400					(3,161)		



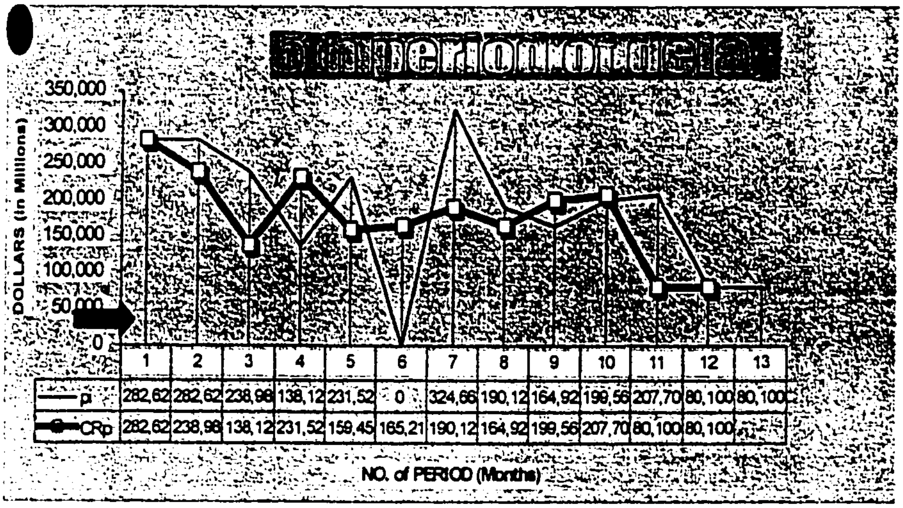
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	**231,520**		0	0	**(135,908)**	**(680)**	**(136,588)**	**(21,971)**
5	159,450	with No risk	50,663	369,640	22,939	115	23,054	1,083
6	165,210		24,729	159,450	(7,436)	(37)	(7,473)	(6,390)
7	190,120		24,729	165,210	(57,112)	(286)	(57,398)	(63,788)
8	164,920		24,729	190,120	(56,927)	(285)	(57,212)	(120,999)
9	199,560		24,729	164,920	(116,581)	(583)	(117,164)	(238,163)
10	207,700		24,729	199,560	(150,033)	(750)	(150,783)	(388,946)
11	80,100		24,729	207,700	(47,912)	(240)	(48,152)	(437,098)
12	80,100		24,729	80,100	(72,881)	(364)	(73,246)	(510,343)
13			24,729	80,100	(17,875)	(89)	(17,964)	(528,308)
	2,138,400					(2,628)		



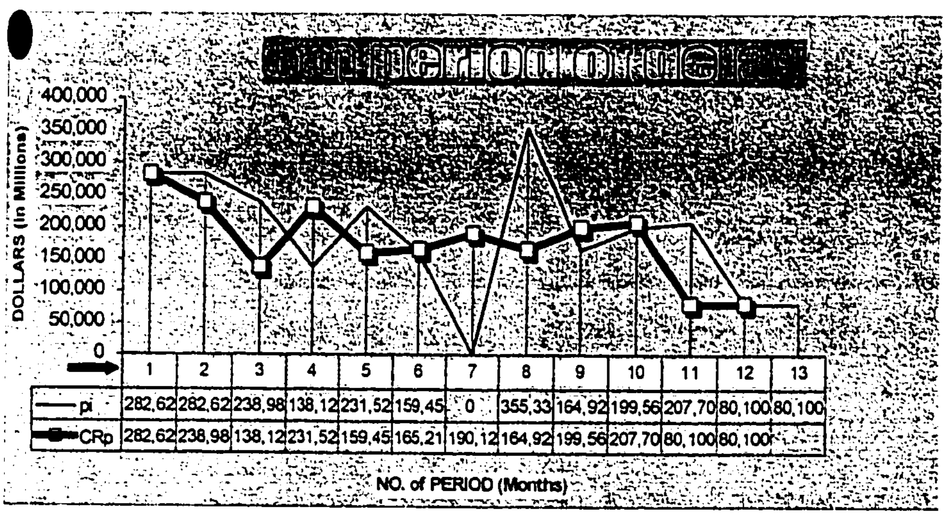
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	**159,450**	with No risk	**0**	**0**	**(182,080)**	**(910)**	**(182,991)**	**(91,004)**
6	165,210		51,010	390,970	(8,240)	(41)	(8,281)	(99,285)
7	190,120		24,729	165,210	(57,921)	(290)	(58,210)	(157,495)
8	164,920		24,729	190,120	(57,739)	(289)	(58,028)	(215,523)
9	199,560		24,729	164,920	(117,397)	(587)	(117,984)	(333,507)
10	207,700		24,729	199,560	(150,854)	(754)	(151,608)	(485,115)
11	80,100		24,729	207,700	(48,737)	(244)	(48,981)	(534,096)
12	80,100		24,729	80,100	(73,710)	(369)	(74,079)	(608,175)
13			24,729	80,100	(18,708)	(94)	(18,801)	(626,976)
	2,138,400					(3,119)		



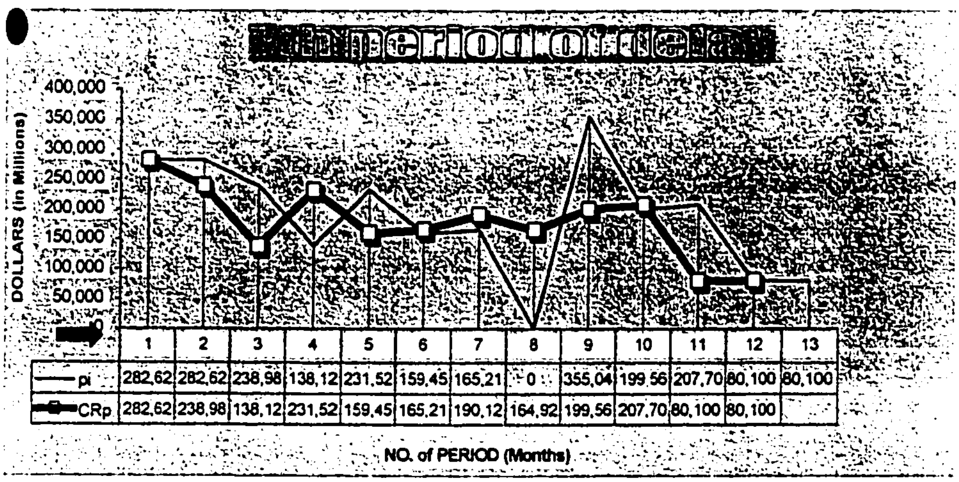
Period	CRp	R	Rp	pi	Dep.Bal	I(D)	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	**165,210**	with No risk	**0**	**0**	**(140,376)**	**(702)**	**(141,078)**	**(24,257)**
7	190,120		50,697	324,660	(57,234)	(286)	(57,521)	(81,777)
8	164,920		24,729	190,120	(57,050)	(285)	(57,335)	(139,112)
9	199,560		24,729	164,920	(116,704)	(584)	(117,288)	(256,400)
10	207,700		24,729	199,560	(150,157)	(751)	(150,908)	(407,308)
11	80,100		24,729	207,700	(48,037)	(240)	(48,277)	(455,586)
12	80,100		24,729	80,100	(73,007)	(365)	(73,372)	(528,957)
13			24,729	80,100	(18,001)	(90)	(18,091)	(547,048)
	2,138,400					(2,722)		



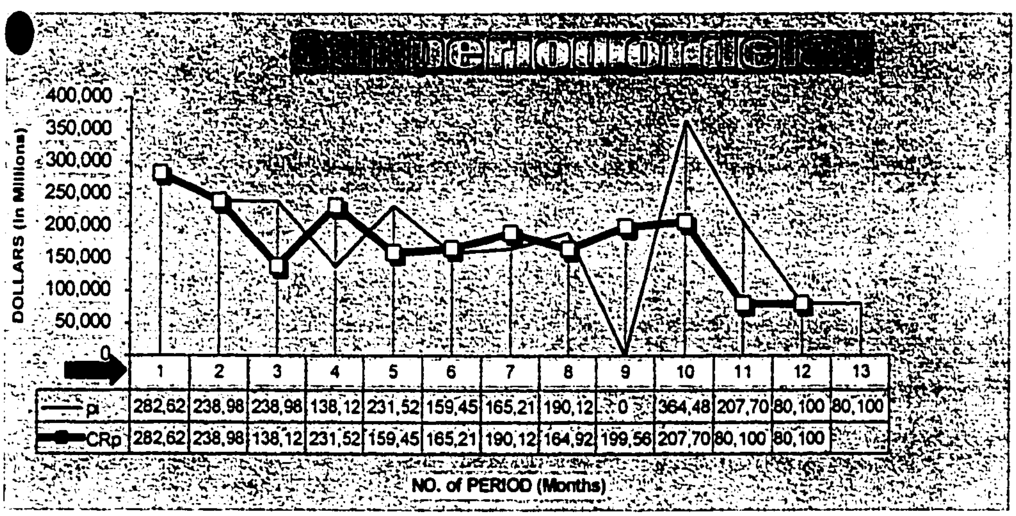
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210	with No risk	24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	**190,120**		**0**	**0**	**(195,803)**	**(979)**	**(196,782)**	**(85,645)**
8	164,920		51,112	355,330	(57,485)	(287)	(57,772)	(143,417)
9	199,560		24,729	164,920	(117,142)	(586)	(117,727)	(261,144)
10	207,700		24,729	199,560	(150,596)	(753)	(151,349)	(412,493)
11	80,100		24,729	207,700	(48,479)	(242)	(48,721)	(461,215)
12	80,100		24,729	80,100	(73,450)	(367)	(73,818)	(535,032)
13			24,729	80,100	(18,447)	(92)	(18,539)	(553,571)
	2,138,400					(2,754)		



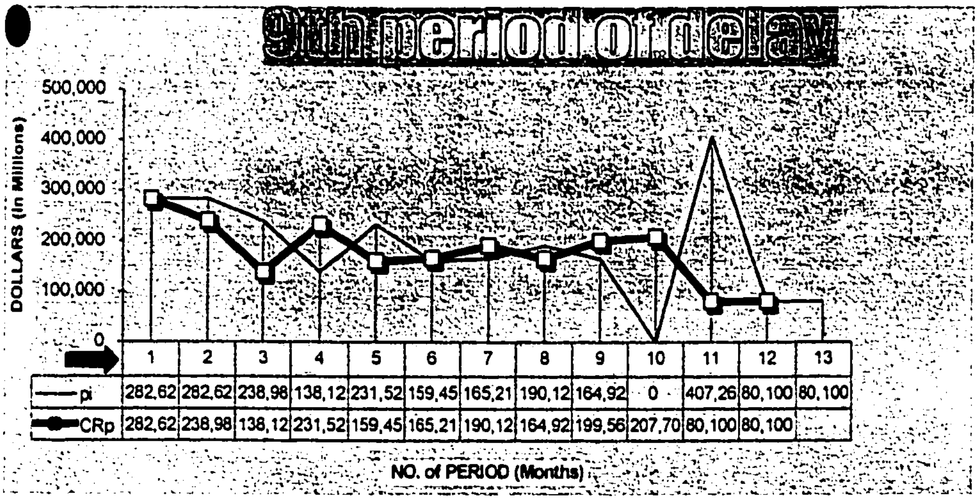
	CRp	R	LRp	pi	DepBal	D	NCF	SCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210	with No risk	24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	**164,920**		**0**	**0**	**(220,519)**	**(1,103)**	**(221,622)**	**(166,083)**
9	199,560		51,298	355,040	(117,440)	(587)	(118,027)	(284,110)
10	207,700		24,729	199,560	(150,896)	(754)	(151,651)	(435,761)
11	80,100		24,729	207,700	(48,780)	(244)	(49,024)	(484,784)
12	80,100		24,729	80,100	(73,753)	(369)	(74,122)	(558,906)
13			24,729	80,100	(18,751)	(94)	(18,845)	(577,751)
	2,138,400					(2,874)		



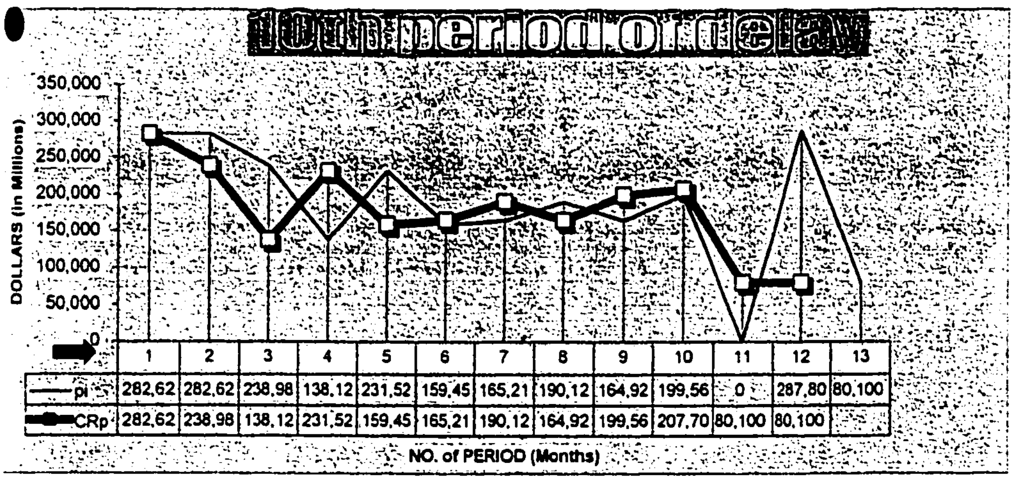
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	238,980	(24,729)	(124)	(24,853)	(24,853)
3	138,120		24,729	238,980	51,278	256	51,534	26,681
4	231,520		24,729	138,120	(66,595)	(333)	(66,928)	(40,247)
5	159,450	with No risk	24,729	231,520	(19,587)	(98)	(19,685)	(59,932)
6	165,210		24,729	159,450	(50,174)	(251)	(50,425)	(110,357)
7	190,120		24,729	165,210	(100,065)	(500)	(100,565)	(210,922)
8	164,920		24,729	190,120	(100,094)	(500)	(100,595)	(311,517)
9	**199,560**		**0**	**0**	**(300,155)**	**(1,501)**	**(301,655)**	**(613,172)**
10	207,700		51,895	364,480	(196,770)	(984)	(197,754)	(810,926)
11	80,100		24,729	207,700	(94,884)	(474)	(95,358)	(906,284)
12	80,100		24,729	80,100	(120,087)	(600)	(120,688)	(1,026,972)
13			24,729	80,100	(65,317)	(327)	(65,644)	(1,092,615)
	2,138,400					(5,436)		



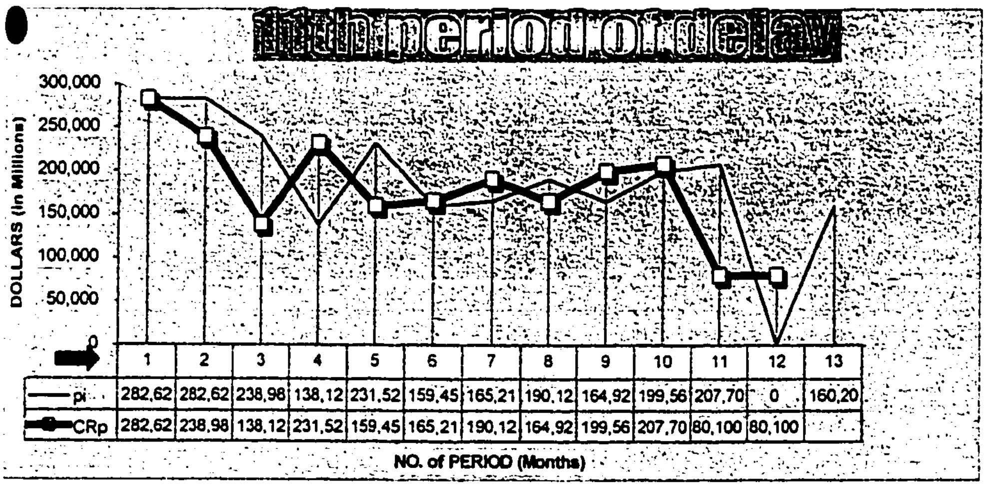
[illegible]	CRp	R	LRp	[illegible]	Dep.Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210	with No risk	24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	**207,700**		**0**	**0**	**(323,047)**	**(1,615)**	**(324,662)**	**(439,875)**
11	80,100		52,067	407,260	(49,569)	(248)	(49,817)	(489,692)
12	80,100		24,729	80,100	(74,546)	(373)	(74,919)	(564,611)
13			24,729	80,100	(19,548)	(98)	(19,646)	(584,257)
	2,138,400					(2,907)		



[illegible]	CRp	R	LRp	pi	Dep.Bal	I	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with No risk	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		24,729	199,560	(148,216)	(741)	(148,958)	(264,170)
11	**80,100**		**0**	**0**	**(229,058)**	**(1,145)**	**(230,203)**	**(494,373)**
12	80,100		51,362	287,800	(73,865)	(369)	(74,234)	(568,607)
13			24,729	80,100	(18,863)	(94)	(18,958)	(587,565)
	2,138,400					(2,923)		

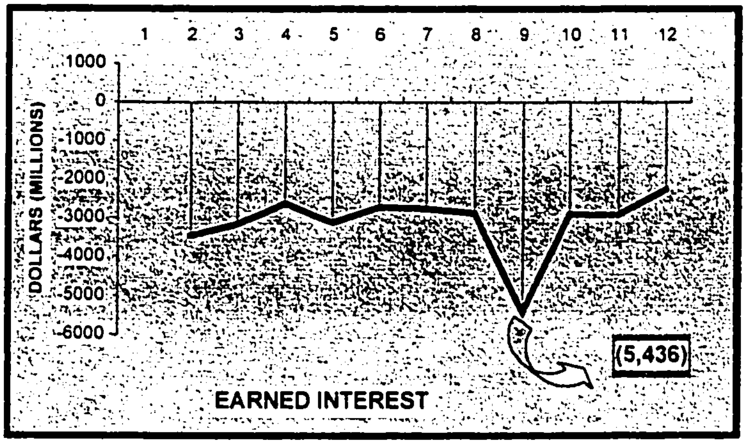


[illegible]	CRp	R	LRp	pi	DepBal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with No risk	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		24,729	199,560	(148,216)	(741)	(148,958)	(264,170)
11	80,100		24,729	207,700	(46,087)	(230)	(46,317)	(310,487)
12	**80,100**		**0**	**0**	**(126,417)**	**(632)**	**(127,049)**	**(437,537)**
13			50,592	160,200	(17,441)	(87)	(17,529)	(455,065)
	2,138,400					(2,264)		



IDENTIFICATION OF DISRUPTION CONSEQUENCE

Delayed Period	[illegible]
1	[illegible]
2	[illegible]
3	[illegible]
4	[illegible]
5	[illegible]
6	[illegible]
7	[illegible]
8	[illegible]
9	[illegible]
10	[illegible]
11	(2,923)
12	(2,262)
MCR	(5,436)

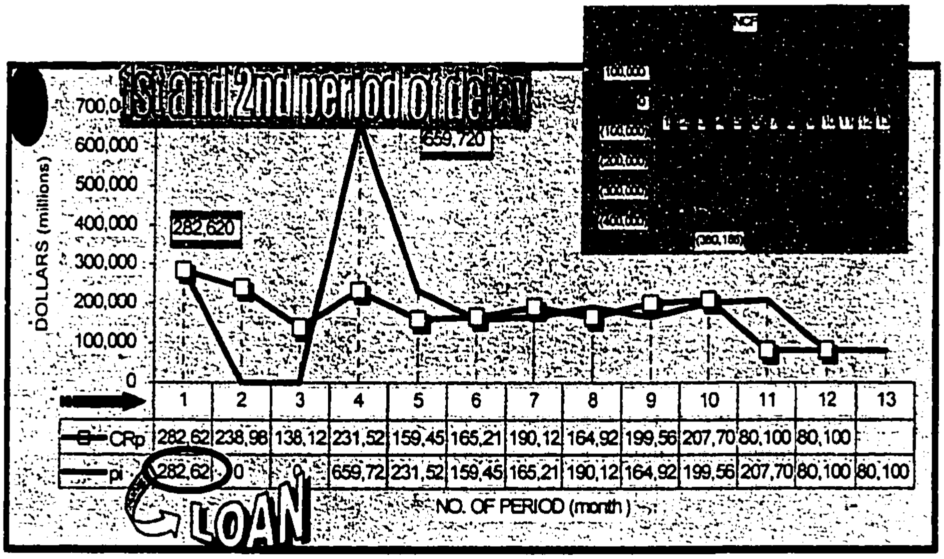


ADDED FINANCING COST

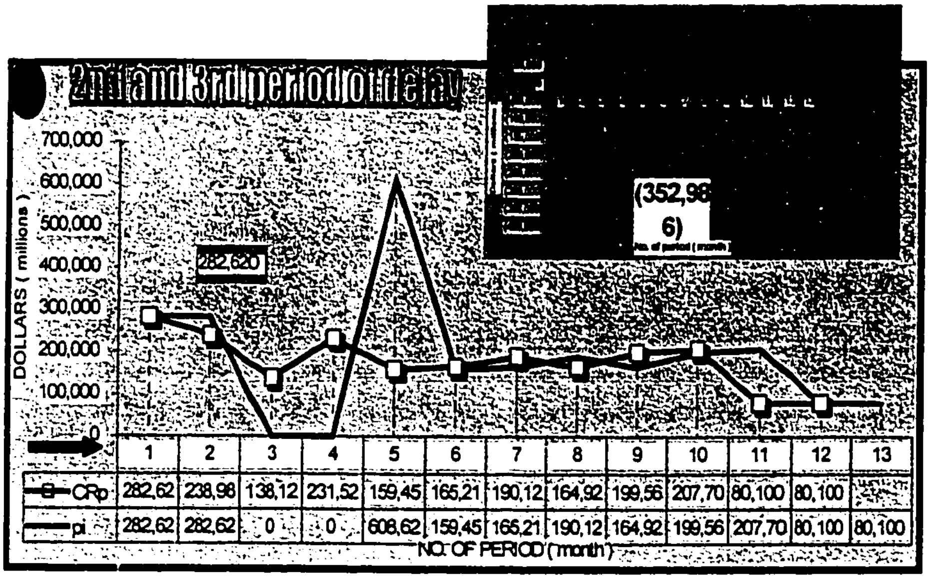
ONE PERIOD DELAY		
CR (T)	MCR	AFC
[illegible]	[illegible]	[illegible]

A-2 TWO PERIODS DELAY

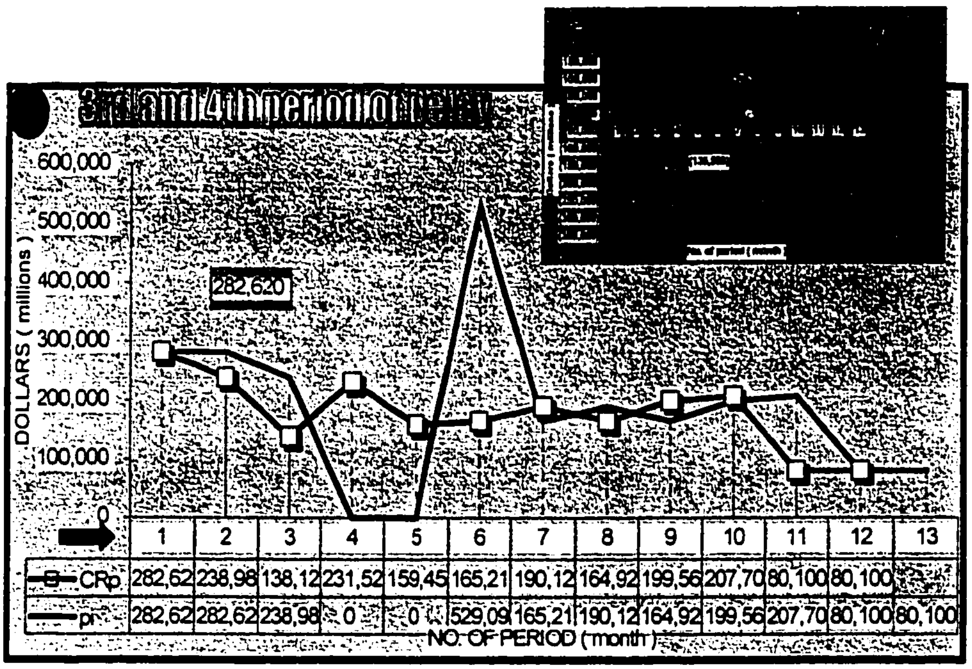
[illegible]	CRp	R	Rp	pi	Dep Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
②	238,980		0	0	(238,980)	(1,195)	**(240,175)**	**(240,175)**
③	138,120		0	0	(378,295)	(1,891)	**(380,186)**	**(620,361)**
4	231,520		79,375	659,720	(31,361)	(157)	(31,518)	(651,880)
5	159,450	with No risk	24,729	231,520	15,822	79	15,902	(635,978)
6	165,210		24,729	159,450	(14,588)	(73)	(14,661)	(650,639)
7	190,120		24,729	165,210	(64,300)	(321)	(64,621)	(715,260)
8	164,920		24,729	190,120	(64,151)	(321)	(64,471)	(779,731)
9	199,560		24,729	164,920	(123,841)	(619)	(124,460)	(904,191)
10	207,700		24,729	199,560	(157,329)	(787)	(158,116)	(1,062,307)
11	80,100		24,729	207,700	(55,245)	(276)	(55,521)	(1,117,828)
12	80,100		24,729	80,100	(80,250)	(401)	(80,652)	(1,198,480)
13			24,729	80,100	(25,281)	(126)	(25,407)	(1,223,887)
Total	2,138,400					(6,089)		



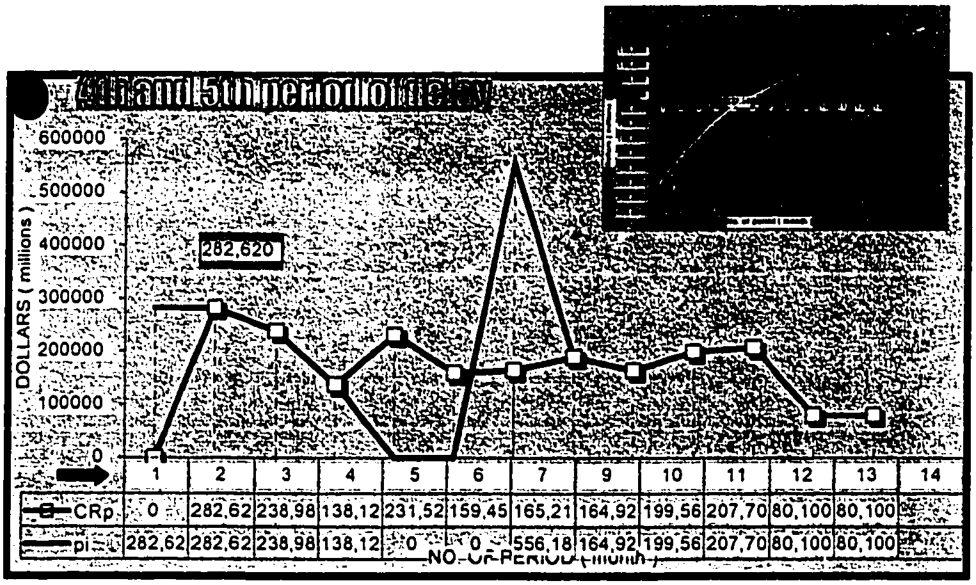
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
③	138,120		0	0	(119,115)	(596)	**(119,710)**	**(100,705)**
④	231,520		0	0	(351,230)	(1,756)	**(352,986)**	**(453,691)**
5	159,450		78,273	608,620	17,910	90	18,000	(435,691)
6	165,210	with No risk	24,729	159,450	(12,489)	(62)	(12,552)	(448,243)
7	190,120		24,729	165,210	(62,191)	(311)	(62,502)	(510,745)
8	164,920		24,729	190,120	(62,031)	(310)	(62,341)	(573,086)
9	199,560		24,729	164,920	(121,711)	(609)	(122,319)	(695,405)
10	207,700		24,729	199,560	(155,188)	(776)	(155,964)	(851,370)
11	80,100		24,729	207,700	(53,094)	(265)	(53,359)	(904,729)
12	80,100		24,729	80,100	(78,088)	(390)	(78,479)	(983,207)
13			24,729	80,100	(23,108)	(116)	(23,224)	(1,006,431)
Total	2,138,400					(5,007)		



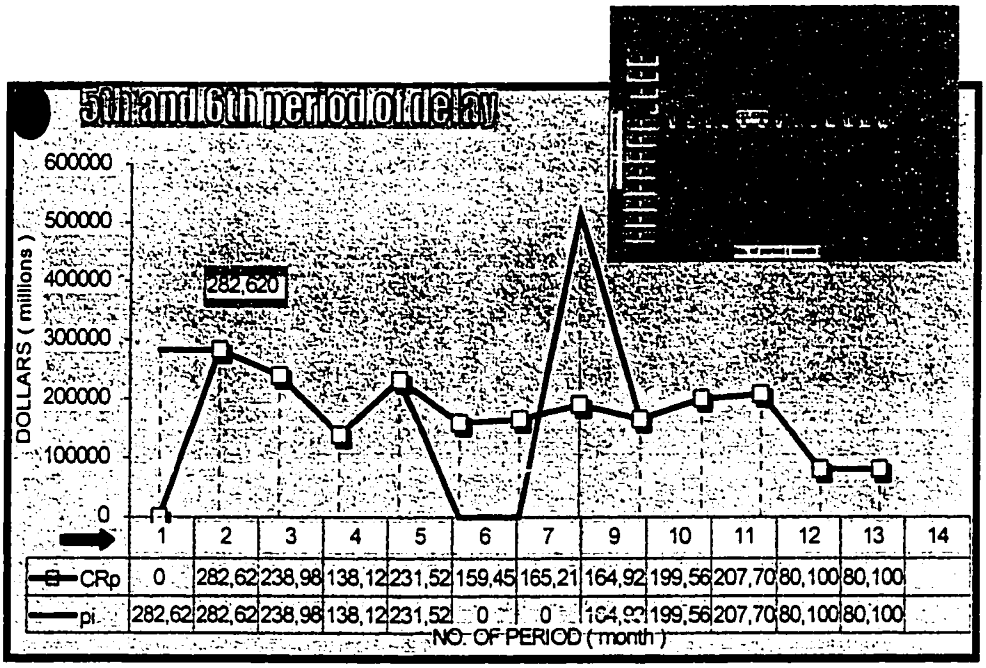
[illegible]	CRp	R	[illegible]	[illegible]	[illegible]	[illegible]	NCF	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
④	231,520		0	0	(135,908)	(680)	**(136,588)**	**(21,971)**
⑤	159,450	with No risk	0	0	(296,038)	(1,480)	**(297,518)**	**(319,489)**
6	165,210		77,985	529,090	(11,623)	(58)	(11,681)	(331,170)
7	190,120		24,729	165,210	(61,321)	(307)	(61,627)	(392,797)
8	164,920		24,729	190,120	(61,156)	(306)	(61,462)	(454,259)
9	199,560		24,729	164,920	(120,831)	(604)	(121,436)	(575,695)
10	207,700		24,729	199,560	(154,305)	(772)	(155,076)	(730,771)
11	80,100		24,729	207,700	(52,206)	(261)	(52,467)	(783,238)
12	80,100		24,729	80,100	(77,196)	(386)	(77,582)	(860,820)
13			24,729	80,100	(22,211)	(111)	(22,322)	(883,142)
Total	2,138,400					(4,394)		



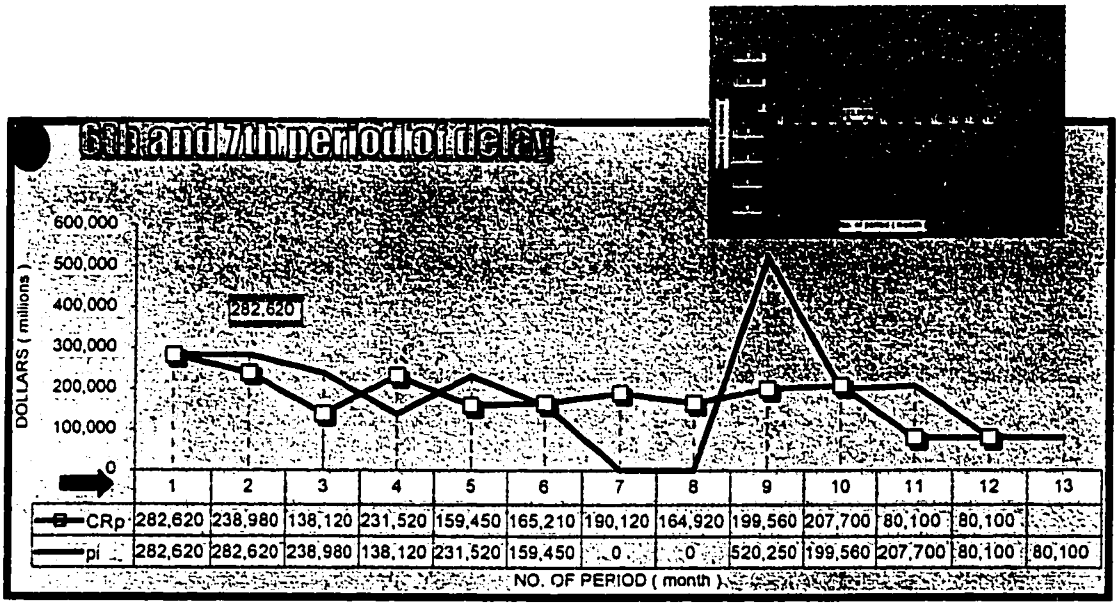
	CRp	R	[illegible]	[illegible]	[illegible]	[illegible]	NCF	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with No risk	0	0	(182,080)	(910)	(182,991)	(91,004)
6	165,210		0	0	(348,201)	(1,741)	(349,942)	(440,945)
7	190,120		78,723	556,180	(62,604)	(313)	(62,917)	(503,862)
8	164,920		24,729	190,120	(62,446)	(312)	(62,759)	(566,621)
9	199,560		24,729	164,920	(122,128)	(611)	(122,739)	(689,359)
10	207,700		24,729	199,560	(155,608)	(778)	(156,386)	(845,745)
11	80,100		24,729	207,700	(53,515)	(268)	(53,783)	(899,528)
12	80,100		24,729	80,100	(78,512)	(393)	(78,904)	(978,432)
13			24,729	80,100	(23,534)	(118)	(23,651)	(1,002,084)
Total	2,138,400					(4,985)		



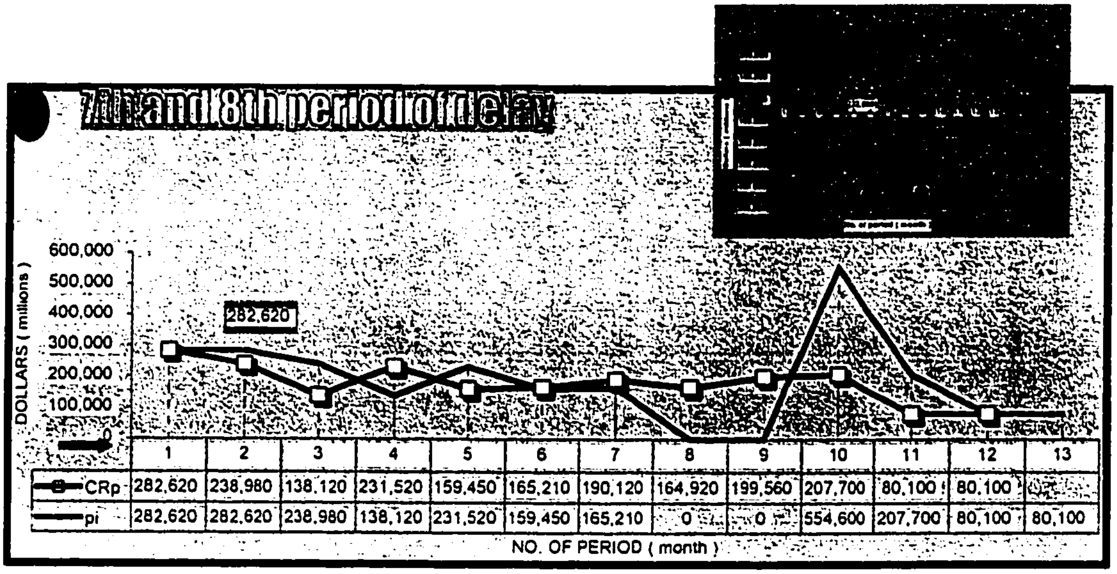
	CRp	CR	Rp	[illegible]	Beg.Bal	ID	[illegible]	CCF
1	282,620			282,620	0	0	0	0
2	238,960		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with No risk	24,729	231,520	24,711	124	24,834	116,821
⑥	165,210		0	0	(140,376)	(702)	(141,078)	(24,257)
⑦	190,120		0	0	(331,198)	(1,656)	(332,854)	(357,110)
8	164,920		76,716	514,780	(59,710)	(299)	(60,009)	(417,119)
9	199,560		24,729	164,920	(119,378)	(597)	(119,975)	(537,093)
10	207,700		24,729	199,560	(152,844)	(764)	(153,608)	(690,701)
11	80,100		24,729	207,700	(50,737)	(254)	(50,991)	(741,693)
12	80,100		24,729	80,100	(75,720)	(379)	(76,099)	(817,791)
13			24,729	80,100	(20,728)	(104)	(20,832)	(838,623)
Total	2,138,400					(4,172)		



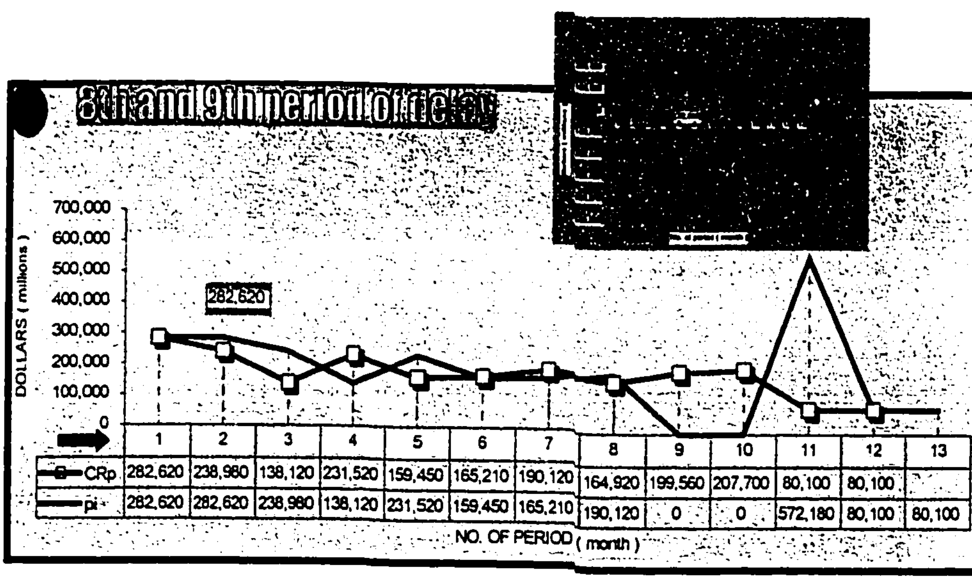
[illegible]	CRp	R	Rp	pi	Dep Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,924	95	19,019	19,019
3	138,120		24,729	238,980	95,164	476	95,639	114,658
4	231,520		24,729	138,120	(22,476)	(112)	(22,589)	92,070
5	159,450	with No risk	24,729	231,520	24,766	124	24,890	116,960
6	165,210		24,729	159,450	(5,586)	(28)	(5,614)	111,346
7	190,120		0	0	(195,734)	(979)	(196,712)	(85,366)
8	164,920		0	0	(361,632)	(1,808)	(363,441)	(448,807)
9	199,560		78,698	520,250	(121,448)	(607)	(122,055)	(570,862)
10	207,700		24,716	199,560	(154,911)	(775)	(155,685)	(726,548)
11	80,100		24,716	207,700	(52,801)	(264)	(53,065)	(779,613)
12	80,100		24,716	80,100	(77,781)	(389)	(78,169)	(857,782)
			24,716	80,100	(22,785)	(114)	(22,899)	(880,681)



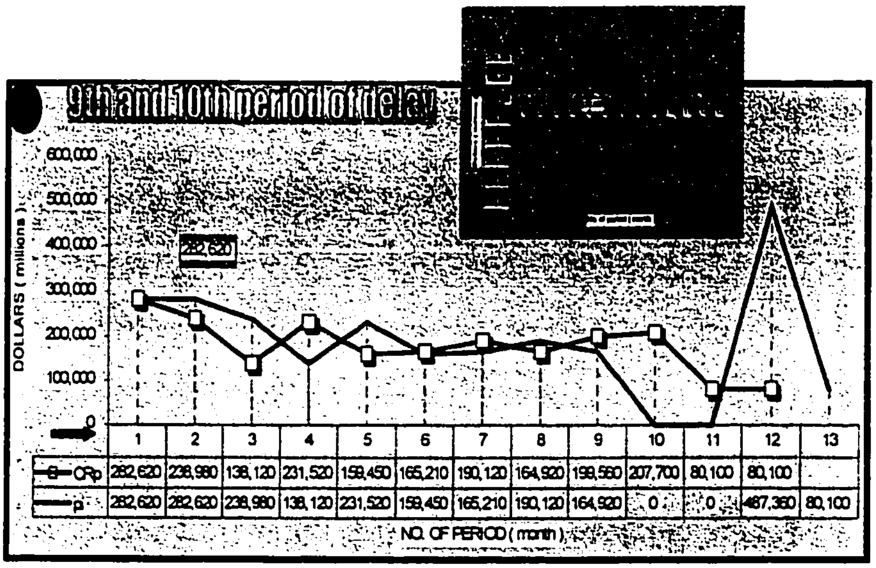
[illegible]	CRp	R	[illegible]Rp	pi	Dep Bal	I	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with No risk	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		0	0	(220,519)	(1,103)	(221,622)	(166,083)
9	199,560		0	0	(421,182)	(2,106)	(423,288)	(589,371)
10	207,700		79,558	554,600	(155,946)	(780)	(156,726)	(746,097)
11	80,100		24,729	207,700	(53,855)	(269)	(54,124)	(800,221)
12	80,100		24,729	80,100	(78,854)	(394)	(79,248)	(879,469)
13			24,729	80,100	(23,877)	(119)	(23,996)	(903,465)
Total	2,138,400					(4,495)		



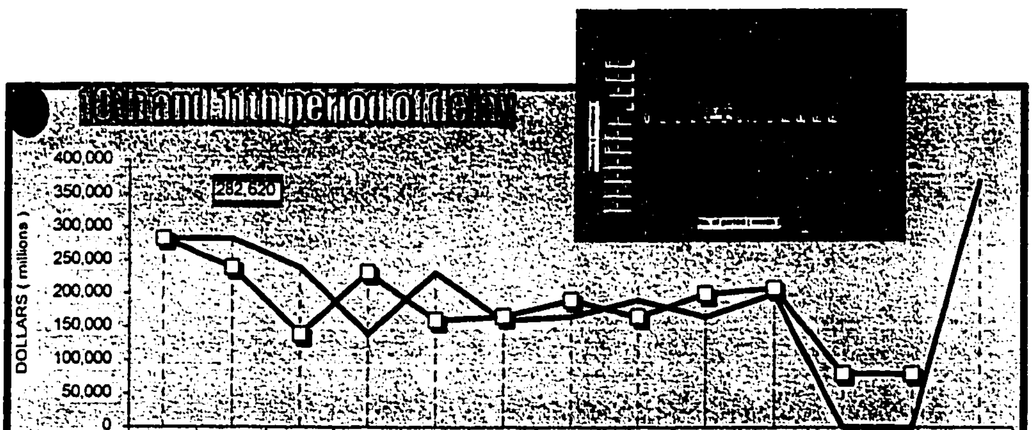
[illegible]	CRp	R	LRp	pi	Dep. Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210	with No risk	24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		0	0	(254,964)	(1,275)	(256,239)	(256,104)
10	207,700		0	0	(463,939)	(2,320)	(466,259)	(722,363)
11	80,100		80,137	572,180	(54,316)	(272)	(54,587)	(776,950)
12	80,100		24,729	80,100	(79,317)	(397)	(79,713)	(856,664)
13			24,729	80,100	(24,343)	(122)	(24,464)	(881,128)
Total	2,138,400					(4,385)		



[illegible]	[illegible]	R	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520	with No risk	24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		0	0	(323,047)	(1,615)	(324,662)	(439,875)
11	80,100		0	0	(404,762)	(2,024)	(406,786)	(846,661)
12	80,100		80,204	487,360	(79,730)	(399)	(80,129)	(926,790)
13			24,729	80,100	(24,758)	(124)	(24,882)	(951,672)
Total	2,138,400					(4,735)		



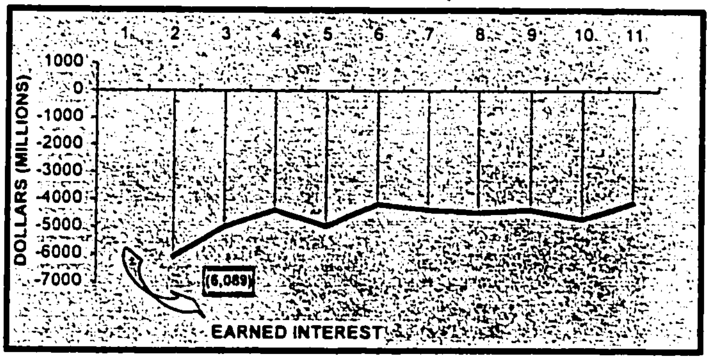
[illegible]	CRp	R	LRp	pi	DepBal	ID	NCF	CCF
1	282,620	with No risk		282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		24,729	199,560	(148,216)	(741)	(148,958)	(264,170)
11	80,100		0	0	(229,058)	(1,145)	(230,203)	(494,373)
12	80,100		0	0	(310,303)	(1,552)	(311,854)	(806,227)
13			78,791	367,900	(22,745)	(114)	(22,859)	(829,086)
Total	2,138,400					(4,125)		



	1	2	3	4	5	6	7	8	9	10	11	12	13
CRp	282,620	238,980	138,120	231,520	159,450	165,210	190,120	164,920	199,560	207,700	80,100	80,100	
pi	282,620	282,620	238,980	138,120	231,520	159,450	165,210	190,120	164,920	199,560	0	0	367,900

IDENTIFICATION OF DISRUPTION CONSEQUENCE

Delayed Period	
1	[illegible]
1-2	[illegible]
2-3	[illegible]
3-4	[illegible]
4-5	[illegible]
5-6	[illegible]
6-7	[illegible]
7-8	[illegible]
8-9	[illegible]
9-10	[illegible]
10-11	[illegible]
[illegible] MCR	[illegible]



ADDED FINANCING COST

TWO PERIODS DELAY [illegible]		
CR (T)	MCR	AFC
[illegible]	[illegible]	[illegible]

B-1 ONE AND TWO PERIOD DELAYS WITH RISK

[illegible]	[illegible]	R	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	**238,980**				**(238,980)**	(1,195)	**(240,175)**	**(240,175)**
3	138,120		32,741	521,600	110,564	553	111,117	(129,058)
4	231,520	Risk 30%	24,729	138,120	(7,013)	(35)	(7,048)	(136,106)
5	159,450		24,729	231,520	40,293	201	40,494	(95,612)
6	165,210		24,729	159,450	10,005	50	10,055	(85,556)
7	190,120		24,729	165,210	(39,584)	(198)	(39,782)	(125,338)
8	164,920		24,729	190,120	(39,311)	(197)	(39,508)	(164,846)
9	199,560		24,729	164,920	(98,877)	(494)	(99,371)	(264,218)
10	207,700		24,729	199,560	(132,241)	(661)	(132,902)	(397,119)
11	80,100		24,729	207,700	(30,031)	(150)	(30,181)	(427,301)
12	80,100		24,729	80,100	(54,910)	(275)	(55,185)	(482,486)
13			24,729	80,100	186	1	187	(482,299)
	2,138,400					(2,399)		

[illegible]	[illegible]	R	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	**238,980**				**(238,980)**	(1,195)	**(240,175)**	**(240,175)**
3	138,120		35,412	521,600	107,893	539	108,432	(131,742)
4	231,520	Risk 40%	24,729	138,120	(9,697)	(48)	(9,745)	(141,488)
5	159,450		24,729	231,520	37,596	188	37,783	(103,704)
6	165,210		24,729	159,450	7,294	36	7,331	(96,373)
7	190,120		24,729	165,210	(42,309)	(212)	(42,520)	(138,894)
8	164,920		24,729	190,120	(42,049)	(210)	(42,260)	(181,153)
9	199,560		24,729	164,920	(101,629)	(508)	(102,137)	(283,290)
10	207,700		24,729	199,560	(135,006)	(675)	(135,681)	(418,971)
11	80,100		24,729	207,700	(32,811)	(164)	(32,975)	(451,946)
12	80,100		24,729	80,100	(57,704)	(289)	(57,992)	(509,938)
13			24,729	80,100	(2,622)	(13)	(2,635)	(512,573)
Total	2,138,400					(2,550)		

[illegible]	CRp	R	Rp	[illegible]	Dep Bal	Ip	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	**138,120**				(119,115)	(596)	**(119,710)**	**(100,705)**
4	231,520	Risk 50%	37,633	377,100	(11,764)	(59)	(11,822)	(112,527)
5	159,450		24,729	231,520	35,518	178	35,696	(76,831)
6	165,210		24,729	159,450	5,207	26	5,233	(71,599)
7	190,120		24,729	165,210	(44,407)	(222)	(44,629)	(116,227)
8	164,920		24,729	190,120	(44,158)	(221)	(44,379)	(160,606)
9	199,560		24,729	164,920	(103,748)	(519)	(104,267)	(264,872)
10	207,700		24,729	199,560	(137,136)	(686)	(137,821)	(402,694)
11	80,100		24,729	207,700	(34,951)	(175)	(35,125)	(437,819)
12	80,100		24,729	80,100	(59,855)	(299)	(60,154)	(497,973)
13			24,729	80,100	(4,783)	(24)	(4,807)	(502,780)
Total	2,138,400					(2,501)		

[illegible]	CRp	R	Rp	[illegible]	Dep Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	**138,120**				(119,115)	(596)	**(119,710)**	**(100,705)**
4	231,520	Risk 60%	40,214	377,100	(14,344)	(72)	(14,416)	(115,121)
5	159,450		24,729	231,520	32,925	165	33,089	(82,032)
6	165,210		24,729	159,450	2,600	13	2,613	(79,419)
7	190,120		24,729	165,210	(47,026)	(235)	(47,261)	(126,680)
8	164,920		24,729	190,120	(46,791)	(234)	(47,025)	(173,705)
9	199,560		24,729	164,920	(106,394)	(532)	(106,926)	(280,630)
10	207,700		24,729	199,560	(139,795)	(699)	(140,494)	(421,124)
11	80,100		24,729	207,700	(37,623)	(188)	(37,811)	(458,936)
12	80,100		24,729	80,100	(62,541)	(313)	(62,853)	(521,789)
13			24,729	80,100	(7,483)	(37)	(7,520)	(529,309)
Total	2,138,400					(2,633)		

[illegible]	CRp	R	ERp	[illegible]	DepBal	[illegible]	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
④	231,520	Risk 50%			(135,908)	(680)	**(136,588)**	**(21,971)**
5	159,450		37,696	369,640	35,906	180	36,085	14,115
6	165,210		24,729	159,450	5,596	28	5,624	19,739
7	190,120		24,729	165,210	(44,015)	(220)	(44,235)	(24,496)
8	164,920		24,729	190,120	(43,764)	(219)	(43,983)	(68,479)
9	199,560		24,729	164,920	(103,352)	(517)	(103,869)	(172,349)
10	207,700		24,729	199,560	(136,738)	(684)	(137,422)	(309,771)
11	80,100		24,729	207,700	(34,551)	(173)	(34,724)	(344,495)
12	80,100		24,729	80,100	(59,453)	(297)	(59,751)	(404,246)
13			24,729	80,100	(4,380)	(22)	(4,402)	(408,648)
Total	2,138,400					(2,033)		

[illegible]	CRp	R	ERp	[illegible]	DepBal	[illegible]	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
④	231,520	Risk 60%			(135,908)	(680)	**(136,588)**	**(21,971)**
5	159,450		40,290	369,640	33,313	167	33,479	11,508
6	165,210		24,729	159,450	2,990	15	3,005	14,513
7	190,120		24,729	165,210	(46,634)	(233)	(46,868)	(32,355)
8	164,920		24,729	190,120	(46,397)	(232)	(46,629)	(78,983)
9	199,560		24,729	164,920	(105,998)	(530)	(106,528)	(185,512)
10	207,700		24,729	199,560	(139,397)	(697)	(140,094)	(325,606)
11	80,100		24,729	207,700	(37,224)	(186)	(37,410)	(363,016)
12	80,100		24,729	80,100	(62,139)	(311)	(62,450)	(425,465)
13			24,729	80,100	(7,079)	(35)	(7,114)	(432,580)
Total	2,138,400					(2,152)		

	CRp	R	LRp	[illegible]	Dep.Bal	D	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	Risk 70%			(182,080)	(910)	**(182,991)**	**(91,004)**
6	165,210		43,125	390,970	(356)	(2)	(358)	(91,361)
7	190,120		24,729	165,210	(49,997)	(250)	(50,247)	(141,608)
8	164,920		24,729	190,120	(49,776)	(249)	(50,025)	(191,633)
9	199,560		24,729	164,920	(109,394)	(547)	(109,941)	(301,575)
10	207,700		24,729	199,560	(142,811)	(714)	(143,525)	(445,099)
11	80,100		24,729	207,700	(40,654)	(203)	(40,857)	(485,957)
12	80,100		24,729	80,100	(65,586)	(328)	(65,914)	(551,871)
13			24,729	80,100	(10,544)	(53)	(10,596)	(562,467)
Total	2,138,400					(2,798)		

	CRp	R	LRp	[illegible]	Dep.Bal	D	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	Risk 80%			(182,080)	(910)	**(182,991)**	**(91,004)**
6	165,210		45,754	390,970	(2,984)	(15)	(2,999)	(94,003)
7	190,120		24,729	165,210	(52,638)	(263)	(52,901)	(146,904)
8	164,920		24,729	190,120	(52,431)	(262)	(52,693)	(199,597)
9	199,560		24,729	164,920	(112,062)	(560)	(112,622)	(312,219)
10	207,700		24,729	199,560	(145,492)	(727)	(146,219)	(458,438)
11	80,100		24,729	207,700	(43,348)	(217)	(43,565)	(502,003)
12	80,100		24,729	80,100	(68,294)	(341)	(68,636)	(570,639)
13			24,729	80,100	(13,265)	(66)	(13,331)	(583,970)
Total	2,138,400					(2,905)		

Period	CRp	R	LRp	Ip	DepBal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
②	238,980				(238,980)	(1,195)	**(240,175)**	**(240,175)**
③	138,120				(378,295)	(1,891)	**(380,186)**	**(620,361)**
4	231,520		49,644	659,720	(1,630)	(8)	(1,638)	(622,000)
5	159,450		24,729	231,520	45,702	229	45,931	(576,069)
6	165,210	with Risk 0%	24,729	159,450	15,442	77	15,519	(560,550)
7	190,120		24,729	165,210	(34,121)	(171)	(34,291)	(594,841)
8	164,920		24,729	190,120	(33,820)	(169)	(33,989)	(628,831)
9	199,560		24,729	164,920	(93,359)	(467)	(93,826)	(722,656)
10	207,700		24,729	199,560	(126,695)	(633)	(127,328)	(849,985)
11	80,100		24,729	207,700	(24,457)	(122)	(24,580)	(874,564)
12	80,100		24,729	80,100	(49,309)	(247)	(49,556)	(924,120)
13			24,729	80,100	5,815	29	5,844	(918,276)
Total	2,138,400					(4,569)		

Period	CRp	R	LRp	Ip	DepBal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
②	238,980				(238,980)	(1,195)	**(240,175)**	**(240,175)**
③	138,120				(378,295)	(1,891)	**(380,186)**	**(620,361)**
4	231,520		52,617	659,720	(4,603)	(23)	(4,626)	(624,988)
5	159,450		24,729	231,520	42,714	214	42,928	(582,060)
6	165,210	with Risk 10%	24,729	159,450	12,439	62	12,501	(569,559)
7	190,120		24,729	165,210	(37,138)	(186)	(37,324)	(606,883)
8	164,920		24,729	190,120	(36,853)	(184)	(37,038)	(643,921)
9	199,560		24,729	164,920	(96,407)	(482)	(96,889)	(740,810)
10	207,700		24,729	199,560	(129,758)	(649)	(130,407)	(871,217)
11	80,100		24,729	207,700	(27,536)	(138)	(27,674)	(898,891)
12	80,100		24,729	80,100	(52,403)	(262)	(52,665)	(951,556)
13			24,729	80,100	2,706	14	2,719	(948,837)
Total	2,138,400					(4,721)		

P	CRp	R	LRp	[illegible]	Dep Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	Risk 30%	24,729	231,520	24,711	124	24,834	116,821
6	165,210				(140,376)	(702)	**(141,078)**	**(24,257)**
7	190,120		32,520	324,660	(39,057)	(195)	(39,252)	(63,509)
8	164,920		24,729	190,120	(38,782)	(194)	(38,976)	(102,485)
9	199,560		24,729	164,920	(98,345)	(492)	(98,837)	(201,321)
10	207,700		24,729	199,560	(131,706)	(659)	(132,364)	(333,686)
11	80,100		24,729	207,700	(29,494)	(147)	(29,641)	(363,327)
12	80,100		24,729	80,100	(54,370)	(272)	(54,642)	(417,969)
13			24,729	80,100	729	4	732	(417,237)
Total	2,138,400					(2,076)		

P	CRp	R	LRp	[illegible]	Dep Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	Risk 40%	24,729	231,520	24,711	124	24,834	116,821
6	165,210				(140,376)	(702)	**(141,078)**	**(24,257)**
7	190,120		35,116	324,660	(41,654)	(208)	(41,862)	(66,119)
8	164,920		24,729	190,120	(41,391)	(207)	(41,598)	(107,717)
9	199,560		24,729	164,920	(100,968)	(505)	(101,473)	(209,190)
10	207,700		24,729	199,560	(134,342)	(672)	(135,013)	(344,203)
11	80,100		24,729	207,700	(32,143)	(161)	(32,303)	(376,507)
12	80,100		24,729	80,100	(57,033)	(285)	(57,318)	(433,824)
13			24,729	80,100	(1,947)	(10)	(1,957)	(435,781)
Total	2,138,400					(2,168)		

	CRp	R	LRp	[illegible]	DepBal	D	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
③	138,120				(119,115)	(596)	**(119,710)**	**(100,705)**
④	231,520				(351,230)	(1,756)	**(352,986)**	**(453,691)**
5	159,450	with Risk 80%	72,547	608,620	23,636	118	23,754	(429,937)
6	165,210		24,729	159,450	(6,735)	(34)	(6,768)	(436,705)
7	190,120		24,729	165,210	(56,408)	(282)	(56,690)	(493,395)
8	164,920		24,729	190,120	(56,219)	(281)	(56,500)	(549,895)
9	199,560		24,729	164,920	(115,869)	(579)	(116,449)	(666,344)
10	207,700		24,729	199,560	(149,318)	(747)	(150,065)	(816,408)
11	80,100		24,729	207,700	(47,194)	(236)	(47,430)	(863,838)
12	80,100		24,729	80,100	(72,159)	(361)	(72,520)	(936,358)
13			24,729	80,100	(17,149)	(86)	(17,235)	(953,593)
Total	2,138,400					(4,744)		

	CRp	R	LRp	[illegible]	DepBal	D	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
③	138,120				(119,115)	(596)	**(119,710)**	**(100,705)**
④	231,520				(351,230)	(1,756)	**(352,986)**	**(453,691)**
5	159,450	with Risk 90%	75,410	608,620	20,773	104	20,877	(432,814)
6	165,210		24,729	159,450	(9,612)	(48)	(9,660)	(442,474)
7	190,120		24,729	165,210	(59,299)	(296)	(59,596)	(502,070)
8	164,920		24,729	190,120	(59,125)	(296)	(59,421)	(561,491)
9	199,560		24,729	164,920	(118,790)	(594)	(119,384)	(680,875)
10	207,700		24,729	199,560	(152,253)	(761)	(153,014)	(833,889)
11	80,100		24,729	207,700	(50,144)	(251)	(50,394)	(884,283)
12	80,100		24,729	80,100	(75,124)	(376)	(75,499)	(959,783)
13			24,729	80,100	(20,129)	(101)	(20,229)	(980,012)
Total	2,138,400					(4,876)		

[illegible]	CRp	R	LRp	pl	DepBal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520				(135,908)	(680)	**(136,588)**	**(21,971)**
5	159,450				(296,038)	(1,480)	**(297,518)**	**(319,489)**
6	165,210	with Risk 50%	63,815	529,090	2,547	13	2,560	(316,929)
7	190,120		24,729	165,210	(47,079)	(235)	(47,314)	(364,243)
8	164,920		24,729	190,120	(46,844)	(234)	(47,078)	(411,321)
9	199,560		24,729	164,920	(106,447)	(532)	(106,979)	(518,300)
10	207,700		24,729	199,560	(139,849)	(699)	(140,548)	(658,848)
11	80,100		24,729	207,700	(37,677)	(188)	(37,866)	(696,714)
12	80,100		24,729	80,100	(62,595)	(313)	(62,908)	(759,622)
13			24,729	80,100	(7,537)	(38)	(7,575)	(767,196)
Total	2,138,400					(3,817)		

[illegible]	CRp	R	LRp	p	DepBal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95.136	476	95,612	114,617
4	231,520				(135,908)	(680)	**(136,588)**	**(21,971)**
5	159,450				(296,038)	(1,480)	**(297,518)**	**(319,489)**
6	165,210	with Risk 60%	66,649	529,090	(287)	(1)	(288)	(319,777)
7	190,120		24,729	165,210	(49,927)	(250)	(50,177)	(369,954)
8	164,920		24,729	190,120	(49,706)	(249)	(49,955)	(419,909)
9	199,560		24,729	164,920	(109,324)	(547)	(109,871)	(529,779)
10	207,700		24,729	199,560	(142,740)	(714)	(143,454)	(673,233)
11	80,100		24,729	207,700	(40,583)	(203)	(40,786)	(714,019)
12	80,100		24,729	80,100	(65,515)	(328)	(65,843)	(779,861)
13			24,729	80,100	(10,472)	(52)	(10,524)	(790,385)
Total	2,138,400					(3,932)		

Period	CRp	R	LRp	pl	Dep.Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 30%			(182,080)	(910)	**(182,991)**	**(91,004)**
6	165,210				(348,201)	(1,741)	**(349,942)**	**(440,945)**
7	190,120		58,368	556,180	(42,249)	(211)	(42,460)	(483,405)
8	164,920		24,729	190,120	(41,990)	(210)	(42,200)	(525,605)
9	199,560		24,729	164,920	(101,569)	(508)	(102,077)	(627,682)
10	207,700		24,729	199,560	(134,946)	(675)	(135,621)	(763,302)
11	80,100		24,729	207,700	(32,750)	(164)	(32,914)	(796,216)
12	80,100		24,729	80,100	(57,643)	(288)	(57,931)	(854,147)
13			24,729	80,100	(2,560)	(13)	(2,573)	(856,720)
Total	2,138,400					(4,262)		

Period	CRp	R	LRp	pl	Dep.Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 40%			(182,080)	(910)	**(182,991)**	**(91,004)**
6	165,210				(348,201)	(1,741)	**(349,942)**	**(440,945)**
7	190,120		61,275	556,180	(45,157)	(226)	(45,383)	(486,328)
8	164,920		24,729	190,120	(44,912)	(225)	(45,137)	(531,464)
9	199,560		24,729	164,920	(104,506)	(523)	(105,028)	(636,493)
10	207,700		24,729	199,560	(137,898)	(689)	(138,587)	(775,080)
11	80,100		24,729	207,700	(35,716)	(179)	(35,895)	(810,975)
12	80,100		24,729	80,100	(60,624)	(303)	(60,927)	(871,902)
13			24,729	80,100	(5,557)	(28)	(5,584)	(877,486)
Total	2,138,400					(4,366)		

[illegible]	GRp	R	LRp	D	DepBal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210	with Risk 70%			(140,376)	(702)	(141,078)	(24,257)
7	190,120				(331,198)	(1,656)	(332,854)	(357,110)
8	164,920		68,595	514,780	(51,588)	(258)	(51,846)	(408,956)
9	199,560		24,729	164,920	(111,215)	(556)	(111,772)	(520,728)
10	207,700		24,729	199,560	(144,641)	(723)	(145,364)	(666,092)
11	80,100		24,729	207,700	(42,493)	(212)	(42,706)	(708,798)
12	80,100		24,729	80,100	(67,435)	(337)	(67,772)	(776,570)
13			24,729	80,100	(12,401)	(62)	(12,463)	(789,033)
Total	2,138,400					(3,926)		

[illegible]	GR[illegible]	R	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210	with Risk 80%			(140,376)	(702)	(141,078)	(24,257)
7	190,120				(331,198)	(1,656)	(332,854)	(357,110)
8	164,920		71,302	514,780	(54,295)	(271)	(54,567)	(411,677)
9	199,560		24,729	164,920	(113,936)	(570)	(114,506)	(526,183)
10	207,700		24,729	199,560	(147,375)	(737)	(148,112)	(674,295)
11	80,100		24,729	207,700	(45,241)	(226)	(45,467)	(719,763)
12	80,100		24,729	80,100	(70,197)	(351)	(70,548)	(790,310)
13			24,729	80,100	(15,177)	(76)	(15,253)	(805,563)
Total	2,138,400					(4,008)		

Period	CRp	R	LRp	pr	Dep Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 40%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120				(195,803)	(979)	(196,782)	(85,645)
8	164,920				(361,702)	(1,809)	(363,511)	(449,155)
9	199,560		61,357	520,250	(104,178)	(521)	(104,699)	(553,854)
10	207,700		24,729	199,560	(137,568)	(688)	(138,256)	(692,110)
11	80,100		24,729	207,700	(35,385)	(177)	(35,562)	(727,672)
12	80,100		24,729	80,100	(60,291)	(301)	(60,593)	(788,265)
13			24,729	80,100	(5,222)	(26)	(5,248)	(793,513)
Total	2,138,400					(3,948)		

Period	CRp	R	LRp	pr	Dep Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 50%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120				(195,803)	(979)	(196,782)	(85,645)
8	164,920				(361,702)	(1,809)	(363,511)	(449,155)
9	199,560		64,285	520,250	(107,106)	(536)	(107,642)	(556,797)
10	207,700		24,729	199,560	(140,511)	(703)	(141,214)	(698,011)
11	80,100		24,729	207,700	(38,343)	(192)	(38,535)	(736,545)
12	80,100		24,729	80,100	(63,264)	(316)	(63,580)	(800,125)
13			24,729	80,100	(8,209)	(41)	(8,250)	(808,376)
Total	2,138,400					(4,022)		

	CRp	R	LRp	[illegible]p[illegible]	Dep-Bal	D	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210	with Risk 50%	24,729	159,450	(5,655)	(28)	(5,683)	111.138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
⑧	164,920				(220,519)	(1,103)	(221,622)	(166,083)
⑨	199,560				(421,182)	(2,106)	(423,288)	(589,371)
10	207,700		64,601	554,600	(140,989)	(705)	(141,694)	(731,065)
11	80,100		24,729	207,700	(38,823)	(194)	(39,017)	(770,082)
12	80,100		24,729	80,100	(63,746)	(319)	(64,065)	(834,147)
13			24,729	80,100	(8,694)	(43)	(8,738)	(842,885)
Total	2,138,400					(4,193)		

	CR[illegible]	R	LRp	[illegible]	Dep-Bal	D	N[illegible]	C[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450		24,729	231,520	24,711	124	24,834	116,821
6	165,210	with Risk 60%	24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
⑧	164,920				(220,519)	(1,103)	(221,622)	(166,083)
⑨	199,560				(421,182)	(2,106)	(423,288)	(589,371)
10	207,700		67,593	554,600	(143,980)	(720)	(144,700)	(734,071)
11	80,100		24,729	207,700	(41,829)	(209)	(42,039)	(776,110)
12	80,100		24,729	80,100	(66,768)	(334)	(67,102)	(843,211)
13			24,729	80,100	(11,731)	(59)	(11,790)	(855,001)
Total	2,138,400					(4,254)		

[illegible]	SRp	$R	LRp	[illegible]	DepB	IE	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 0%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560				(254,964)	(1,275)	(256,239)	(256,104)
10	207,700				(463,939)	(2,320)	(466,259)	(722,363)
11	80,100		49,644	572,180	(23,823)	(119)	(23,942)	(746,305)
12	80,100		24,729	80,100	(48,671)	(243)	(48,914)	(795,219)
13			24,729	80,100	6,456	32	6,489	(788,730)
Total	2,138,400					(3,924)		

[illegible]	SRp	$R	LRp	[illegible]	DepB	IE	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 10%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560				(254,964)	(1,275)	(256,239)	(256,104)
10	207,700				(463,939)	(2,320)	(466,259)	(722,363)
11	80,100		52,693	572,180	(26,872)	(134)	(27,006)	(749,369)
12	80,100		24,729	80,100	(51,736)	(259)	(51,994)	(801,363)
13			24,729	80,100	3,377	17	3,393	(797,970)
Total	2,138,400					(3,970)		

[illegible]	CRp	R	LRp	[illegible]	Dep Bal	ID	NCE	CCE
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 60%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700				(323,047)	(1,615)	(324,662)	(439,875)
11	80,100				(404,762)	(2,024)	(406,786)	(846,661)
12	80,100		67,980	487,360	(67,506)	(338)	(67,844)	(914,505)
13			24,729	80,100	(12,473)	(62)	(12,535)	(927,041)
Total	2,138,400					(4,612)		

[illegible]	CRp	R	LRp	[illegible]	Dep Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 70%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700				(323,047)	(1,615)	(324,662)	(439,875)
11	80,100				(404,762)	(2,024)	(406,786)	(846,661)
12	80,100		71,036	487,360	(70,562)	(353)	(70,915)	(917,576)
13			24,729	80,100	(15,544)	(78)	(15,622)	(933,199)
Total	2,138,400					(4,643)		

[illegible]	CRp	R	LRp	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 20%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		24,729	199,560	(148,216)	(741)	(148,958)	(264,170)
11	80,100				(229,058)	(1,145)	(230,203)	(494,373)
12	80,100				(310,303)	(1,552)	(311,854)	(806,227)
13			55,473	367,900	572	3	575	(805,652)
Total	2,138,400					(4,008)		

[illegible]	CRp	R	LRp	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 30%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		24,729	199,560	(148,216)	(741)	(148,958)	(264,170)
11	80,100				(229,058)	(1,145)	(230,203)	(494,373)
12	80,100				(310,303)	(1,552)	(311,854)	(806,227)
13			58,388	367,900	(2,342)	(12)	(2,354)	(808,581)
Total	2,138,400					(4,023)		

[illegible]	GRp	R	LRp	pi	Dep.Bal	ID	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 20%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		24,729	199,560	(148,216)	(741)	(148,958)	(264,170)
11	80,100				(229,058)	(1,145)	(230,203)	(494,373)
12	80,100				(310,303)	(1,552)	(311,854)	(806,227)
13			55,473	367,900	572	3	575	(805,652)
Total	2,138,400					(4,008)		

[illegible]	GRp	R	[illegible]	[illegible]	Dep.Bal	[illegible]	NCF	CCF
1	282,620			282,620	0	0	0	0
2	238,980		24,729	282,620	18,911	95	19,005	19,005
3	138,120		24,729	238,980	95,136	476	95,612	114,617
4	231,520		24,729	138,120	(22,518)	(113)	(22,630)	91,987
5	159,450	with Risk 30%	24,729	231,520	24,711	124	24,834	116,821
6	165,210		24,729	159,450	(5,655)	(28)	(5,683)	111,138
7	190,120		24,729	165,210	(55,323)	(277)	(55,599)	55,539
8	164,920		24,729	190,120	(55,128)	(276)	(55,404)	135
9	199,560		24,729	164,920	(114,773)	(574)	(115,347)	(115,213)
10	207,700		24,729	199,560	(148,216)	(741)	(148,958)	(264,170)
11	80,100				(229,058)	(1,145)	(230,203)	(494,373)
12	80,100				(310,303)	(1,552)	(311,854)	(806,227)
13			58,388	367,900	(2,342)	(12)	(2,354)	(808,581)
Total	2,138,400					(4,023)		