Appendix – II

Interview Schedule
FINANCIAL RISK TOLERANCE OF PORTFOLIO INVESTORS

APPEAL

Dear Sir/Madam,

Greetings.

I am R ARUL, Ph.D Research Scholar, PG and Research Department of Commerce, St.Joseph’s College (Autonomous), Trichirappalli-620002, undertaking a project survey on “Financial Risk Tolerance of Portfolio Investors”.

I humbly request you to be honest about your choices, as you are not going to be evaluated and assessed by the choices you make in this questionnaire. Be assured that there are no rights or wrong answers.

Please answer all the questions one of the options. Choose the option that best indicates how you feel about each question. If none of the options is exactly right for you, choose the option that is closest.

It will be highly appreciated if you could provide the data needed for the study by responding to this set of questions.

I assure that the data provided by you will be kept strictly confidential and under anonymity and will be used for research purpose only. Anticipating your whole heart cooperation I assure you that the data collected from you will be kept strictly confidential and would be used for purely academic purpose.

In case you have any query and/or suggestion, please, feel free to send them to Dr. FRANCIS GNANASEKAR, M.Com., M.B.A B.Ed M.Phil., Ph.D., who is my guide and supervisor, through his e-mail: francis_sekar@rediffmail.com or to me through my e-mail: arulfriends2005@gmail.com

Your help in this regard is highly acknowledged and appreciated. Please forward to your share investors friends its helps for my study.

Thank you,

Yours obediently,

R ARUL

R ARUL, Ph.D Research Scholar, PG and Research Department of Commerce, St.Joseph’s College (Autonomous), Trichirappalli-620002.
FINANCIAL RISK TOLERANCE OF PORTFOLIO INVESTORS

Please answer all the questions one of the options. Choose the option that best indicates how you feel about each question. If none of the options is exactly right for you, choose the option that is closest.

DEMOGRAPHIC QUESTIONNAIRE

1. I am 1. Male 2. Female

2. Age
   1. age 18 to 25  2. age 26 to 33  3. age 34 to 41
   4. age 42 to 49  5. Above 50

   5. Others (specify)


5. Nature of Place of Birth 1. Rural 2. Urban


8. Which is your brokerage company (Select any one)
   1. Kotak securities limited 2. Karvy stock broking limited 3. India bulls
   4. IL&FS Investmart limited 5. Motilal Oswal securities 6. Reliance money
   10. Geojit

9. Income per month 1. Below 20,000 2. 20,001-40,000 3. 40,001-60,000
   4. Above 60,001-80,000 5. 80,001 - 100,000

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FINANCIAL RISK TOLERANCE OF PORTFOLIO INVESTORS

10. Are you married?
   1. Yes  2. No

11. How many people in your family, beside yourself, do you fully or partially support financially?
   1. None  2. One  3. Two  4. Three  5. Four or more

12. Investment Pattern

   *National Capital Region (NCR)
FINANCIAL RISK TOLERANCE OF PORTFOLIO INVESTORS

FINANCIAL GOALS

1. Investments: I do not need a high level of current income from my Investments. I’m more interested in their long-term growth potential.


2. Large expenses: I have set aside savings to cover large expenses like purchasing a home, college tuition or a financial emergency.


3. Inflation: I am concerned about the effects of inflation on my investments.


4. How easily do you adapt when things go wrong financially?


5. Have you ever invested a large sum in a risky investment mainly for the “thrill” of seeing whether it went up or down in value?


6. Have you ever borrowed money to make an investment (other than for your home)?


7. Think of the average return you would expect to earn on an investment portfolio over the next ten years. How does this compare with what you think you would earn if you invested the money in fixed deposits (i.e. FD’s) at your bank?

   5. Above the same rate of interest as from fixed deposits
   4. Above one and two a half times the rate of interest from fixed deposits
   3. Above twice the rate of interest from fixed deposits
   2. Above three times the rate of interest from fixed deposits
   1. More than three times the rate of interest from fixed deposits

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FINANCIAL RISK TOLERANCE OF PORTFOLIO INVESTORS

8. With some types of investment, such as cash and term deposits, the money value of the investment is fixed. However, inflation will cause the purchasing power of this money value to decrease. With other types of investment, such as shares and property, the money value is not fixed. It will vary. In the short term, it may even fall below the purchase price. However, over the long term, the money value of shares and property should certainly increase by more than the rate of inflation. With this in mind, which is more important to you, that the money value of your investments does not fall or that it retains its purchasing power?

   5. Much more important that the money value does not fall
   4. Somewhat more important that the money value does not fall.
   3. Somewhat more important that the money value retains its purchasing power.
   2. Much more important the money value retains its purchasing power.
   1. None

RISK TOLERANCE

9. When you think of the word “risk” in a financial context, which of the following words comes to mind first?


10. Compared to others, how do you rate your willingness to take financial risks?


11. Volatility: I can tolerate sharp ups and downs in the short-term value of my investments in return for potential long-term gains.


12. Risk vs. reward: Hypothetically, I prefer an investment that has a 50 percent chance of losing five percent and a 50 percent chance of gaining 20 percent in one year, rather than an investment that will assure a 5 percent return in one year.


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FINANCIAL RISK TOLERANCE OF PORTFOLIO INVESTORS

13. Decline in value: I am comfortable holding on to an investment even though it drops sharply in value.

14. Equity investing: I am willing to take the risks associated with stocks in order to earn a potential return greater than the rate of inflation.

15. Knowledge of risk: I consider myself knowledgeable about the risks and potential returns associated with investing in stocks and other types of securities.

16. Investments can go up or down in value, and experts often say you should be prepared to weather a downturn. By how much could the total value of all your investments go down before you would begin to feel uncomfortable?
   5. More than 50% 4. 50% 3. 33% 2. 20% 1. 10%

17. In recent years, how have your personal investments changed?
   5. Always toward higher risk
   4. Mostly toward higher risk
   3. No changes or changes with no clear direction
   2. Mostly toward lower risk
   1. Always toward lower risk
FINANCIAL RISK TOLERANCE OF PORTFOLIO INVESTORS

18. Most investment portfolios have a spread of investments – some of the investments may have high expected returns but with a high degree of risk, some may have medium expected returns and medium risk, and some may have low risk and low return. (For example, investments in common stock and real estate would be considered high risk/high return whereas cash and term deposits would be low risk/low return.) Which spread of investments do you find most appealing?

<table>
<thead>
<tr>
<th>High Risk/Return</th>
<th>Medium Risk/Return</th>
<th>Low Risk/Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Portfolio 1</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2. Portfolio 2</td>
<td>0%</td>
<td>30%</td>
</tr>
<tr>
<td>3. Portfolio 3</td>
<td>10%</td>
<td>40%</td>
</tr>
<tr>
<td>4. Portfolio 4</td>
<td>30%</td>
<td>40%</td>
</tr>
<tr>
<td>5. Portfolio 5</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>6. Portfolio 6</td>
<td>70%</td>
<td>30%</td>
</tr>
<tr>
<td>7. Portfolio 7</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>

19. You are considering placing 25% of your portfolio into a single investment. This investment is expected to earn about twice the investment transaction Fixed Deposit rate. However, unlike a Fixed Deposit, this investment is not protected against loss of the money invested. How low would the chance of loss have to be for you to make the investment?

5. 75% chance of loss
4. 50% chance of loss
3. Moderately low chance of loss
2. Very low chance of loss
1. Zero, i.e. no chance of any loss

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FINANCIAL RISK TOLERANCE OF PORTFOLIO INVESTORS

20. When making an investment, risk and return usually go hand-in-hand. Investments which produce above-average returns are usually of above-average risk. With this in mind, how much of the funds you have available to invest would you be willing to place in investments where both returns and risks are expected to be above average?

5. Above 91%  4. 61%-90%  3. 31% -60%  2. 1% - 30%  1. None

21. People often arrange their financial affairs so as to qualify for a government benefit or to obtain a tax advantage. However a change in legislation can leave them worse off than if they have done nothing with this in mind would you take a risk in arranging your affairs to qualify for a government benefit or obtain a tax advantage?

5. No idea about risk in arranging your affairs to qualify for a government benefit or obtain a tax advantage.
4. I would take a risk as long as there was more than a 50% chance that I would finish up better off.
3. I would not take a risk as long as there was more than a 50% chance that I would finish up better off.
2. I would take a risk if there was only a small chance I could finish up worse (not as good as) off.
1. I would not take a risk if there was any chance I could finish up worse (not as good as off).

TIME HORIZON

22. Your personal timeline: In how many years do you plan to utilize the results of your investment strategy?

1. within a year

23. Long-term investing: I am comfortable with an investment that may take 10 years to provide the returns I expect.

24. Imagine you are borrowing a large sum of money at some time in the future. It’s not clear which way interest rates are going to move – they might go up, they might go down, no one seems to know. You could take a variable interest rate loan where the rate will rise and fall as the market rate changes. Or you could take a fixed interest rate which is 1% more than the current variable rate but which won’t change as the market rate changes. Or you could take a mix of both. How would you prefer your loan to be made up?

5. 100% fixed
4. 25% variable, 75% fixed
3. 50% variable, 50% fixed
2. 75% variable, 25% fixed
1. 100% variable

25. Suppose that 5 years ago you bought shares in a highly regarded company. That same year the company experienced a severe decline in sales due to poor management. The price of the shares dropped drastically and you sold at a substantial loss. The company has been restructured under new management and most experts now expect its shares to produce better than average returns. Given your bad past experience with this company would you buy shares now?


26. Insurance can cover a wide variety of life’s major risks – theft, fire, accident, illness, death and so on. How much coverage do you have?

FINANCIAL RISK TOLERANCE OF PORTFOLIO INVESTORS

JOB SECURITY
27. If you had to choose between more job security with a small pay raise and less job security with a big pay raise, which would you pick?
5. Definitely less job security with a big pay raise
4. Probably less job security with a big pay raise
3. Not sure
2. Probably more job security with a small pay raise
1. Definitely more job security with a small pay raise

28. If you were in a job where you could choose to be paid in salary, commission or a mix of both, which would you pick?
5. Only commission
4. Mainly commission
3. Equal mix of salary and commission
2. Mainly salary
1. Only salary

FINANCIAL DECISION
29. When faced with a major financial decision, are you more concerned about the possible losses or the possible gains?
5. Always the possible gains
4. Usually the possible gains
3. Not sure
2. Usually the possible losses
1. Always the possible losses

30. How do you usually feel about your major financial decisions after you make them?
5. Very optimistic
4. Somewhat optimistic
3. Not sure
2. Somewhat pessimistic
1. Very pessimistic

31. What degree of risk have you taken with your financial decisions in the past?
5. Very large
4. Large
3. Medium
2. Small
1. Very small

32. What degree of risk are you currently prepared to take with your financial decisions?
5. Very large
4. Large
3. Medium
2. Small
1. Very small

33. How much confidence do you have in your ability to make good financial decisions?
5. Complete
4. A great deal
3. A reasonable amount
2. A little
1. None

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RISK TOLERANCE: A CASE STUDY ON FINANCIAL DECISION USING DATA ENVELOPMENT ANALYSIS

Dr. I Francis Gnanasekar\textsuperscript{1} \hspace{1cm} RAru\textsuperscript{2}

\textbf{ABSTRACT}

According to Peter Drucker “Making good decisions is a crucial skill at every level”. The financing decisions are decisions concerned regarding the method that are used to raise 

funds which would be used for making acquisitions. The financing decisions  are decisions concerning the liabilities and stockholders’ 

equity side of the firm’s balance sheet, such as a decision to issue bonds. A grouping of financial assets such as stocks, bonds and cash equivalents, as well as their mutual, exchange-traded and closed-fund counterparts. Portfolios are held directly by investors and/or managed by financial professionals. Investors are of different types. There are conservative, moderately liberal, 

Moderate, Moderately aggressive and Aggressive. Moreover, investor’s risk tolerance varies on the basis of age, sex, income, financial goals and so on. Data envelopment analysis (DEA) is a nonparametric method in operations research and economics for the estimation of production frontiers. It is used to empirically measure productive efficiency of decision making units (or DMUs). Non-parametric approaches have the benefit of not assuming a particular functional form/shape for the frontier, however they do not provide a general relationship (equation) relating output and input.

\textbf{Keywords:} Risk Tolerance, Estimation Bias, Differential Prediction

\section*{INTRODUCTION}

Nearly all researchers and financial services practitioners working in the personal and household finance field acknowledge that financial risk tolerance, which is generally defined as a person’s willingness to engage in a financial behavior in which the outcomes are uncertain (Grable, 2008), differs among people based on age. In particular, the most common assumption stipulates that older individuals are less risk tolerant than younger persons. Although there is an ongoing debate regarding the risk tolerance-age relationship, with some arguing that there is no age-risk tolerance association (Chauk, Johnson, & Bulcroft, 2003) or that risk tolerance increases with age, very few studies have addressed the issue of differential prediction associated with the risk tolerance-age association.

The purpose of this study was to address this need in the literature. Specifically, differential prediction, as conceptualized in this study, deals with how accurately working adults at different ages in the lifespan are able to estimate their risk-taking propensity.

\section*{OBJECTIVES OF THE STUDY}

The overall objective of the study is to find out the efficiency of portfolio investors in their financial Decision using Data Envelopment Analysis. The following are the more specific objectives. They are:

1. To use the TORA tool to analyze the input-output of portfolio investors in their financial Decision;

2. To use the TORA tool to analyze the following inputs namely Sex, Age, Religion etc.

\section*{METHODOLOGY OF THE STUDY}

\section*{DATA COLLECTION}

In order to perform the above said objectives, the researchers used an online survey to collect data. The data was collected through online survey questionnaire sent to the experience investors enrolled in major share trading concerns in Tiruchirappalli Corporation. The researchers had several round of talks with the leading share trading concerns like ARAs Securities Private Limited, Kavy, Angel Broking Limited and so on. They gave a list of experienced, regular, loyal customer investors. After collecting the e-mail id of the selected investors, the researcher used Google Documents as a distributing engine through e-mail. The researcher sent the questionnaireon February 2012. The researcher has sent several reminders to the investors and closed the entry up to June 2012. In this study 100 investors were responded in which 66 are male and 34 are female.

\section*{TOOLS USED}

Data Envelopment Analysis is a Linear Programming technique which is used for measuring the efficiency of the decision-making units. Usually, efficiency is defined in the ratio of input and output. “TORA” is a tool which is used in this study.

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\textsuperscript{2} Ph.D Research Scholar, PG And Research Department Of Commerce, St.Joseph’s College (Autonomous) Tiruchirappalli
### Table-1: Efficiency of Financial Decision of Portfolio Investors in Their Possible Losses or The Possible Gains

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1 Sex = 100</td>
<td>U1 = Always the possible losses = 10</td>
</tr>
<tr>
<td>V2 Age = 302</td>
<td>U2 = Usually the possible losses = 16</td>
</tr>
<tr>
<td>V3 Religion = 202</td>
<td>U3 = Not sure = 25</td>
</tr>
<tr>
<td>V4 Qualification = 357</td>
<td>U4 = Usually the possible gains = 36</td>
</tr>
<tr>
<td>V5 Nature of Place of Birth = 157</td>
<td>U5 = Always the possible gains = 13</td>
</tr>
<tr>
<td>V6 State = 166</td>
<td></td>
</tr>
<tr>
<td>V7 Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8 Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9 Martial Status = 128</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 313</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Field Data)

<table>
<thead>
<tr>
<th>Q.NO</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>BEST</th>
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</thead>
<tbody>
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<td>0.3992</td>
<td>0.4785</td>
<td>0.6451</td>
<td>0.2539</td>
<td>0.6451</td>
<td>U4</td>
</tr>
</tbody>
</table>

(Result: This result is taken from TORA Software package)

### Inference

For the given output the efficiency of portfolio investors in their financial Decision in their Possible Losses or Possible Gains is unit Four Usually the possible gains is efficient, Always the possible losses, usually the possible losses. Not sure, Always the possible gains are inefficient.

The efficiency of portfolio investors in financial Decision in their Possible Losses or Possible Gains is unit Four Usually the possible gains is efficient. As per TORA result 0.2227 under Conservative Investor Categories, 0.2539 under Moderately Conservative Investor, 0.3992 under Moderate, 0.4785 under Moderate Aggressive Investor categories and 0.6451 under Aggressive Investor categories in their Risks.

### Table-02: Efficiency of Financial Decision of Portfolio Investors in Their Major Financial Decisions

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
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<td>V1 Sex = 100</td>
<td>U1 = Very pessimistic = 12</td>
</tr>
<tr>
<td>V2 Age = 302</td>
<td>U2 = Somewhat pessimistic = 19</td>
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<tr>
<td>V3 Religion = 202</td>
<td>U3 = Not sure = 19</td>
</tr>
<tr>
<td>V4 Qualification = 357</td>
<td>U4 = Somewhat optimistic = 37</td>
</tr>
<tr>
<td>V5 Nature of Place of Birth = 157</td>
<td>U5 = Very optimistic = 13</td>
</tr>
<tr>
<td>V6 State = 166</td>
<td></td>
</tr>
<tr>
<td>V7 Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8 Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9 Martial Status = 128</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 313</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Field Data)
### Table-03 : Efficiency of Financial Decision of Portfolio Investors in Their Past Financial Decisions

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1 Sex = 100</td>
<td>U1 Very pessimistic = 12</td>
</tr>
<tr>
<td>V2 Age = 302</td>
<td>U2 Somewhat pessimistic = 19</td>
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<tr>
<td>V3 Religion = 202</td>
<td>U3 Not sure = 19</td>
</tr>
<tr>
<td>V4 Qualification = 357</td>
<td>U4 Somewhat optimistic = 37</td>
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<tr>
<td>V5 Nature of Place of Birth = 157</td>
<td>U5 Very optimistic = 13</td>
</tr>
<tr>
<td>V6 State = 166</td>
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<td>V7 Occupation = 223</td>
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<tr>
<td>V8 Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9 Martial Status = 128</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 313</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Field Data)

(RESULT: This result is taken from TORA Software package)

### Inference:
For the given output the efficiency of portfolio investors in their Major financial Decision is unit Four Somewhat optimistic is efficient, Very pessimistic, Somewhat Pessimistic, Not sure, Very optimistic are inefficient. The efficiency of portfolio investors in their Major financial Decision is unit Four Somewhat optimistic is efficient. As per TORA result 0.2254 under Conservative Investor Categories, 0.3101 under Moderately Conservative Investor, 0.3163 under Moderate, 0.4732 under Moderate Aggressive Investor categories and 0.6745 under Aggressive Investor categories in their Risks.

### Table-04 : Efficiency of Financial Decision of Portfolio Investors in Their Current Financial Decisions

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1 Sex = 100</td>
<td>U1 Very pessimistic = 12</td>
</tr>
<tr>
<td>V2 Age = 302</td>
<td>U2 Somewhat pessimistic = 19</td>
</tr>
<tr>
<td>V3 Religion = 202</td>
<td>U3 Not sure = 19</td>
</tr>
<tr>
<td>V4 Qualification = 357</td>
<td>U4 Somewhat optimistic = 37</td>
</tr>
<tr>
<td>V5 Nature of Place of Birth = 157</td>
<td>U5 Very optimistic = 13</td>
</tr>
<tr>
<td>V6 State = 166</td>
<td></td>
</tr>
<tr>
<td>V7 Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8 Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9 Martial Status = 128</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 313</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Field Data)

(RESULT: This result is taken from TORA Software package)

### Inference:
For the given output the efficiency of portfolio investors in their Past financial Decision is unit Three Medium is efficient, Very small, small, Large, Very Large are inefficient. The efficiency of portfolio investors in their Past financial Decision is unit Three Medium is efficient. As per TORA result 0.1773 under Conservative Investor Categories, 0.2236 under Moderately Conservative Investor, 0.3733 under Moderate, 0.5507 under Moderate Aggressive Investor categories and 0.6745 under Aggressive Investor categories in their Risks.
Inference:
For the given output the efficiency of portfolio investors in their Current financial Decision is unit Three Medium is efficient. VerySmall, small, Large, VeryLarge are inefficient. The efficiency of portfolio investors in their Current financial Decision is unit Three Medium is efficient.

As per TORA result 0.1194 under Conservative Investor Categories, 0.2397 under Moderately Conservative Investor, 0.2664 under Moderate, 0.4465 under Moderate Aggressive Investor categories and 0.9277 under Aggressive Investor categories in their Risks.

Table-05: Efficiency of Financial Decision of Portfolio Investors in Their Ability to Make Good Financial Decisions

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1 Sex = 100</td>
<td>U1 Very small = 11</td>
</tr>
<tr>
<td>V2 Age = 302</td>
<td>U2 Small = 21</td>
</tr>
<tr>
<td>V3 Religion = 202</td>
<td>U3 Medium = 49</td>
</tr>
<tr>
<td>V4 Qualification = 357</td>
<td>U4 Large = 13</td>
</tr>
<tr>
<td>V5 Nature of Place of Birth = 157</td>
<td>U5 Verylarge = 6</td>
</tr>
<tr>
<td>V6 State = 166</td>
<td></td>
</tr>
<tr>
<td>V7 Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8 Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9 Martial Status = 128</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 313</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Field Data)

(Results: This result is taken from TORA software package)

Inference:
For the given output the efficiency of portfolio investors in their ability to make good financial Decision is unit Three A reasonable amount is efficient. None, A little, A Great deal, Complete are inefficient. The efficiency of portfolio investors in their ability to make good financial Decision is unit Three a reasonable amount is efficient.

As per TORA result 0.2067 under Conservative Investor Categories, 0.2094 under Moderately Conservative Investor, 0.4741 under Moderate, 0.5222 under Moderate Aggressive Investor categories and 0.5872 under Aggressive Investor categories in their Risks.

ANALYSIS AND RESULTS
1. The efficiency of portfolio investors in financial Decision in their Possible Losses or Possible Gains is unit Four Usually the possible gains is efficient.

2. The efficiency of portfolio investors in their Major financial Decision is unit Four Somewhat optimistic is efficient.

3. The efficiency of portfolio investors in their Past financial Decision is unit Three Medium is efficient.

4. The efficiency of portfolio investors in their Current financial Decision is unit Three Medium is efficient.

5. The efficiency of portfolio investors in their ability to make good financial Decision is unit Three a reasonable amount is efficient.

CONCLUSION
The researchers use the TORA tool to analyze the input-output efficiency of portfolio investors in their financial decisions. The financing decisions are decisions concerned regarding the method that are used to raise
funds which would be used for making acquisitions. The financing decisions are decisions concerning the liabilities and stockholders’ equity side of the firm’s balance sheet, such as a decision to issue bonds. In this study, researchers found out some efficiency of portfolio investors. The efficiency of portfolio investors in their Current financial Decision is unit Three Medium is efficient. The efficiency of portfolio investors in their Major financial Decision is unit Four Somewhat optimistic is efficient.

Investors are of different types. In this study the researchers found out various types of investors like conservative, moderately conservative, Aggressive and moderately aggressive. Moreover, investor’s risk tolerance varies on the basis of age, sex, income, financial goals and so on.
| 24. | FINANCIAL RISK TOLERANCE USING DATA ENVELOPMENT ANALYSIS - A CASE STUDY |
|     | DR. I FRANCIS GNANASEKAR, R ARUL | 251-262 |

| 25. | FINANCIAL RISK TOLERANCE USING DATA ENVELOPMENT ANALYSIS - A CASE STUDY |
|     | DR. I FRANCIS GNANASEKAR, R ARUL | 263-274 |

| 26. | MANAGEMENT OF HIGHER EDUCATION INSTITUTIONS: ISSUES AND CHALLENGES |
|     | DR HEERA LAL SHARMA, RAJESH TIWARI, DR. BIMAL ANJUM | 275-284 |
FINANCIAL RISK TOLERANCE USING DATA ENVELOPMENT ANALYSIS- A CASE STUDY

DR. I FRANCIS GNANASEKAR*; R ARUL**

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TIRUCHIRAPPALLI,TAMILNADU
INDIA

**PH.D RESEARCH SCHOLAR IN COMMERCE
PG AND RESEARCH DEPARTMENT OF COMMERCE,
ST.JOSEPH'S COLLEGE (AUTONOMOUS)
TIRUCHIRAPPALLI,TAMILNADU
INDIA

ABSTRACT

According to Warren Edward Buffett “Risk is a part of God's game, alike for men and nations.” The term portfolio refers to any collection of financial assets such as stocks, bonds, and cash. Portfolios may be held by individual investors and/or managed by financial professionals, hedge funds, banks and other financial institutions. It is a generally accepted principle that a portfolio is designed according to the investor's risk tolerance, time frame and investment objectives. The monetary value of each asset may influence the risk/reward ratio of the portfolio and is referred to as the asset allocation of the portfolio. (Investopedia). Investors are of different types. There are conservative, moderately conservative, Moderate, Moderately aggressive and Aggressive. Moreover, investor’s risk tolerance varies on the basis of age, sex, income, financial goals and so on.

Data envelopment analysis (DEA) is a nonparametric method in operations research and economics for the estimation of production frontiers. It is used to empirically measure productive efficiency of decision making units (or DMUs). Non-parametric approaches have the benefit of not assuming a particular functional form/shape for the frontier; however they do not provide a general relationship (equation) relating output and input. (Aristovnik, A, 2012).

TORA (Toolkit for Oracle) is a free software database development and administration available. It features a PL/SQL debugger, an SQL worksheet with syntax highlighting, a database browser and a comprehensive set of database browser and a comprehensive set of database administration tools (Steven Feuerstein, 2002). In addition to Oracle Database Support, for MySQL, PostgreSQL, and Teradata databases has been added since the initial launch. (https://sourceforge.net/), (http://torasql.com/News).

In this paper the researchers wish to a study Case Study on Financial Risk Tolerance Using Data Envelopment Analysis.

KEYWORDS: Portfolio Investors, Risk tolerance, Data envelopment analysis.
Introduction

According to Warren Edward Buffett “Risk is a part of God's game, alike for men and nations.” The term portfolio refers to any collection of financial assets such as stocks, bonds, and cash. Portfolios may be held by individual investors and/or managed by financial professionals, hedge funds, banks and other financial institutions. It is a generally accepted principle that a portfolio is designed according to the investor's risk tolerance, time frame and investment objectives. The monetary value of each asset may influence the risk/reward ratio of the portfolio and is referred to as the asset allocation of the portfolio. (Investopedia). Investors are of different types. There are conservative, moderately conservative, Moderate, Moderately aggressive and Aggressive. Moreover, investor’s risk tolerance varies on the basis of age, sex, income, financial goals and so on.

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Statement of the Problem

Investors are of different types. There are conservative, moderately conservative, Moderate, Moderately aggressive and Aggressive. Moreover, investor’s risk tolerance varies on the basis of age, sex, income, financial goals and so on.

DEA also scores each individual between 0 and 1, where one shows that the person is the most risk taking person in the sample and zero shows that the person is the most risk averse person in the sample if, of course, that is how the model is constructed.

This application not only improves the quality of existing risk tolerance assessment techniques but also explores a new application area for Data Envelopment Analysis as well. If this application works DEA can also be used as a reliable tool for any attitude measurement program.

Objectives of the Study

The overall objective of the study is to find out the efficiency of portfolio investors in their financial risk tolerance using Data Envelopment Analysis. The following are the more specific objectives. They are;

1. to use the TORA tool to analyze the input-output of portfolio investors in their financial risk tolerance;
2. to use the TORA tool to analyze the following inputs namely
   (i)  Sex
   (ii)  Age
   (iii) Religion
   (iv)  Qualification
   (v)   Nature of Place of birth
   (vi)  State
   (vii) Occupation
   (viii) Income
   (ix)  Marital Status
   (x)  Financial Support
3. to use the TORA tool to analyze the following Outputs namely
   (i) Volatility
   (ii) Decline in value
   (iii) Equity investing

253
(iv) Investments can go up or down in value
(v) Personal investments
(vi) Financial affairs

Review of Literature

Eiteman W.J., C.C. Dice, and D.K. Eiteman (1966) studied the performance of several stocks in 1965. The stock price indices are similar in that they attempted to measure the average price level for their respective population of stocks. Cohen K.J and Fitch B.P Studied the average investment performance of some selected indices in 1966. King (1966) studied this problem and concluded that the market index accounted for about 50 per cent of the volatility of stock returns over time. An additional 10 per cent could be attributed, he thought, to industry classification.

Investment risk tolerance is known by many different names, but it's all the same thing. Some of the other names are: Investor risk tolerance, risk temperament, risk profile, investment profile, investor profile, investment profiler, investor profiler, risk attitudes, and investing risk tolerance. Investment risk tolerance is used in most of the CFA readings, so we're sticking with that. Because none of this is an exact science, most investment managers work with three to seven risk categories. We use five because we feel there isn't enough and seven is too many. (http://toolsformoney.com).

Data Envelopment Analysis is a methodology which is used to determine relative efficiencies between decision making units (DMUs). It was first developed by Charnes, Cooper and Rhodes (1978). A DMU can be any entity like a hospital, school or bank. Among a group of DMUs, DEA helps to distinguish between the efficient and the inefficient DMUs.

Methodology of the Study

A. Data Collection

In order to perform the above said objectives, the researcher used an online survey to collect data. The data was collected through online survey questionnaire sent to the experience investors enrolled in major share trading concerns in Tiruchirappalli Corporation. The researcher had several round of talks with the leading share trading concerns. They gave a list of experienced, regular, loyal customer investors. After collecting the e-mail id of the selected investors, the researcher used Google Documents as a distributing engine through e-mail. The researcher sent the questionnaire on February 2012. The researcher has sent several reminders to the investors and closed the entry up to June 2012. In this study 100 investors were responded in which 66 are male and 34 are female.

B. Tools used

Data Envelopment Analysis is a Linear Programming technique which is used for measuring the efficiency of the decision-making units. Usually, efficiency is defined in the ratio of input and output. “TORA” is a tool which is used in this study.
**TABLE – 01**

**EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR VOLATILITY**

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1 Sex = 100</td>
<td>U1 Strongly disagree = 9</td>
</tr>
<tr>
<td>V2 Age = 302</td>
<td>U2 Disagree = 15</td>
</tr>
<tr>
<td>V3 Religion = 202</td>
<td>U3 Neutral = 27</td>
</tr>
<tr>
<td>V4 Qualification = 357</td>
<td>U4 Agree = 42</td>
</tr>
<tr>
<td>V5 Nature of Place of Birth = 157</td>
<td>U5 Strongly agree = 7</td>
</tr>
<tr>
<td>V6 State = 166</td>
<td></td>
</tr>
<tr>
<td>V7 Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8 Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9 Martial Status = 154</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 221</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Data

<table>
<thead>
<tr>
<th>T.NO</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>BEST</th>
<th>VARIABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.2067</td>
<td>0.3698</td>
<td>0.5374</td>
<td>0.7218</td>
<td>0.1639</td>
<td>0.7218</td>
<td>U4</td>
</tr>
</tbody>
</table>

(Result: This result is taken from TORA Software package)

**Inference:**

For the given output the efficiency of Risk Tolerance of portfolio investors in their Volatility is unit four, Agree is efficient, Strongly disagree, Disagree, Neutral, Strongly agree are inefficient.

During Volatility investors agree to tolerate sharp ups and downs in the short-term value of their investments in return for potential long term gains.

As per TORA result 0.1639 under Conservative Investor Categories, 0.2067 under Moderately Conservative Investor, 0.3698 under Moderate, 0.5374 under Moderate Aggressive Investor categories and 0.7218 under Aggressive Investor categories in their Volatility.
TABLE – 02
EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR DECLINE IN VALUE

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
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</thead>
<tbody>
<tr>
<td>V1 Sex = 100</td>
<td>U1 Strongly disagree = 14</td>
</tr>
<tr>
<td>V2 Age = 302</td>
<td>U2 Disagree = 31</td>
</tr>
<tr>
<td>V3 Religion = 202</td>
<td>U3 Neutral = 26</td>
</tr>
<tr>
<td>V4 Qualification = 357</td>
<td>U4 Agree = 20</td>
</tr>
<tr>
<td>V5 Nature of Place of Birth = 157</td>
<td>U5 Strongly agree = 09</td>
</tr>
<tr>
<td>V6 State = 166</td>
<td></td>
</tr>
<tr>
<td>V7 Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8 Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9 Martial Status = 154</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 221</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Data

<table>
<thead>
<tr>
<th>T.NO</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>BEST</th>
<th>VARIABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.3261</td>
<td>0.6977</td>
<td>0.4366</td>
<td>0.3457</td>
<td>0.1933</td>
<td>0.6977</td>
<td>U2</td>
</tr>
</tbody>
</table>

(Result: This result is taken from TORA Software package)

Inference:

For the given output the efficiency of Risk Tolerance of portfolio investors in their Decline in value is unit Two, Disagree is efficient, Strongly disagree, Neutral, Agree, Strongly agree are inefficient.

During Decline in value Investors are not comfortable holding on to an investment even through it drops sharply in value.

As per TORA result 0.1933 under Conservative Investor Categories, 0.3261 under Moderately Conservative Investor, 0.3457 under Moderate, 0.4366 under Moderate Aggressive Investor categories and 0.6977 under Aggressive Investor categories in their Decline in value.
TABLE – 03
EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR EQUITY INVESTING

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1  Sex = 100</td>
<td>U1  Strongly disagree = 7</td>
</tr>
<tr>
<td>V2  Age = 302</td>
<td>U2  Disagree = 18</td>
</tr>
<tr>
<td>V3  Religion = 202</td>
<td>U3  Neutral = 24</td>
</tr>
<tr>
<td>V4  Qualification = 357</td>
<td>U4  Agree = 38</td>
</tr>
<tr>
<td>V5  Nature of Place of Birth = 157</td>
<td>U5  Strongly agree = 13</td>
</tr>
<tr>
<td>V6  State = 166</td>
<td></td>
</tr>
<tr>
<td>V7  Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8  Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9  Martial Status = 154</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 221</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Data

<table>
<thead>
<tr>
<th>T.NO</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>BEST</th>
<th>VARIABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.1773</td>
<td>0.4580</td>
<td>0.4348</td>
<td>0.7183</td>
<td>0.2112</td>
<td>0.7183</td>
<td>U4</td>
</tr>
</tbody>
</table>

(Result: This result is taken from TORA Software package)

Inference:

For the given output the efficiency of Risk Tolerance of portfolio investors in their Equity Investing is unit four, Agree is efficient, Strongly disagree, Disagree, Neutral, Strongly agree are inefficient.

Equity investing Investors are willing to take the risks associated with stocks in order to earn a potential return greater than the rate of inflation.

As per TORA result 0.1773 under Conservative Investor Categories, 0.2112 under Moderately Conservative Investor, 0.4348 under Moderate, 0.4580 under Moderate Aggressive Investor categories and 0.7183 under Aggressive Investor categories in their Equity Investing.
TABLE – 04
EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR INVESTMENTS CAN GO UP OR DOWN IN VALUE

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1  Sex = 100</td>
<td>U1  10% = 16</td>
</tr>
<tr>
<td>V2  Age = 302</td>
<td>U2  20% = 19</td>
</tr>
<tr>
<td>V3  Religion = 202</td>
<td>U3  33% = 41</td>
</tr>
<tr>
<td>V4  Qualification = 357</td>
<td>U4  50% = 14</td>
</tr>
<tr>
<td>V5  Nature of Place of Birth = 157</td>
<td>U5  More than 50% = 10</td>
</tr>
<tr>
<td>V6  State = 166</td>
<td></td>
</tr>
<tr>
<td>V7  Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8  Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9  Martial Status = 154</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 221</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Data

<table>
<thead>
<tr>
<th>T.NO</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>BEST</th>
<th>VARIABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.3841</td>
<td>0.3733</td>
<td>0.8065</td>
<td>0.3109</td>
<td>0.1800</td>
<td>0.8065</td>
<td>U3</td>
</tr>
</tbody>
</table>

(Result: This result is taken from TORA Software package)

Inference:

For the given output the efficiency of Risk Tolerance of portfolio investors in their Investments Can Go up or down in Value is unit three, 33 Per cent is efficient, 10 Per cent, 20 Per cent, 50 Percent , More than 50 Per cent are inefficient.

Investors can go up or down in 33 per cent value of all their investments go down before they feel uncomfortable.

As per TORA result 0.1800 under Conservative Investor Categories, 0.3109 under Moderately Conservative Investor,0.3733 under Moderate, 0.3841 under Moderate Aggressive Investor categories and 0.8065 under Aggressive Investor categories in their Investments Can Go up or down in Value.
### Table 05

**Efficiency of Risk Tolerance of Portfolio Investors in their Personal Investments**

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1 Sex = 100</td>
<td>U1 Always toward lower risk = 9</td>
</tr>
<tr>
<td>V2 Age = 302</td>
<td>U2 Mostly toward lower risk = 24</td>
</tr>
<tr>
<td>V3 Religion = 202</td>
<td>U3 No changes or changes with no clear direction = 35</td>
</tr>
<tr>
<td>V4 Qualification = 357</td>
<td>U4 Mostly toward higher risk = 21</td>
</tr>
<tr>
<td>V5 Nature of Place of Birth = 157</td>
<td>U5 Always toward higher risk = 11</td>
</tr>
<tr>
<td>V6 State = 166</td>
<td></td>
</tr>
<tr>
<td>V7 Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8 Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9 Martial Status = 154</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 221</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Data

(Result: This result is taken from TORA Software package)

**Inference:**

For the given output the efficiency of Risk Tolerance of portfolio investors in their Personal Investment is unit three, No changes or changes with no clear direction is efficient, Always toward lower risk, Mostly toward lower risk, Mostly toward higher risk, Always toward higher risk are inefficient.

In recent years, investors there are No changes or changes with no clear direction in their Personal Investments.

As per TORA result 0.2094 under Conservative Investor Categories, 0.2218 under Moderately Conservative Investor, 0.4036 under Moderate, 0.5347 under Moderate Aggressive Investor categories and 0.6300 under Aggressive Investor categories in their Personal Investment.
TABLE – 06
EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR FINANCIAL AFFAIRS

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
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</thead>
<tbody>
<tr>
<td>V1 Sex = 100</td>
<td>U1 = 14</td>
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<tr>
<td>V2 Age = 302</td>
<td>U2 = 24</td>
</tr>
<tr>
<td>V3 Religion = 202</td>
<td>U3 = 26</td>
</tr>
<tr>
<td>V4 Qualification = 357</td>
<td>U4 = 13</td>
</tr>
<tr>
<td>V5 Nature of Place of Birth = 157</td>
<td>U5 = 23</td>
</tr>
<tr>
<td>V6 State = 166</td>
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<tr>
<td>V7 Occupation = 223</td>
<td></td>
</tr>
<tr>
<td>V8 Income = 232</td>
<td></td>
</tr>
<tr>
<td>V9 Martial Status = 154</td>
<td></td>
</tr>
<tr>
<td>V10 Financial Support = 221</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Data

<table>
<thead>
<tr>
<th>T.NO</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>BEST</th>
<th>VARIABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0.3109</td>
<td>0.4719</td>
<td>0.5338</td>
<td>0.2480</td>
<td>0.4206</td>
<td>0.5338</td>
<td>U3</td>
</tr>
</tbody>
</table>

(Result: This result is taken from TORA Software package)

Inference:
For the given output the efficiency of Risk Tolerance of portfolio investors in their Financial Affairs is unit three, Investors would not take a risk as long as there was more than a 50 Per cent chance that Investors would finish up better off. is efficient, Investors would not take a risk if there was any change Investors could finish up worse (not as good as off, Investors would take a risk if there was only a small chance Investors could finish up worse (not as good as) off, Investors would take a risk as long as there was more than a 50 Per cent chance that Investors would finish up better off. No idea about risk in arranging your affairs to qualify for a government benefit or obtain a tax advantage are inefficient.

Investors would not take a risk as long as there was more than a 50 Per cent chance that Investor would finish up better off their Financial Affairs so as to qualify for a government benefit or to obtain a tax advantage.

As per TORA result 0.2480 under Conservative Investor Categories, 0.3109 under Moderately Conservative Investor, 0.4206 under Moderate, 0.4719 under Moderate Aggressive Investor categories and 0.5338 under Aggressive Investor categories in their Financial Affairs.
Finding of the Study

There are Five Factors are responsible for Financial Risk tolerance of Portfolio Investors. In Risk Tolerance Factor, Volatility, Decline in Value, Equity Investing, Investments Can Go up or down in Value, Personal Investment, Financial Affairs are studied through TORA Model.

During Volatility investors agree to tolerate sharp ups and downs in the short-term value of their investments in return for potential long term gains.

During Decline in value Investors are not comfortable holding on to an investment even through it drops sharply in value.

Equity investing Investors are willing to take the risks associated with stocks in order to earn a potential return greater than the rate of inflation.

Investors can go up or down in 33 per cent value of all their investments go down before they feel uncomfortable.

In recent years, investors there are No changes or changes with no clear direction in their Personal Investments.

Investors would not take a risk as long as there was more than a 50 Per cent chance that Investor would finish up better off their Financial Affairs so as to qualify for a government benefit or to obtain a tax advantage.

Conclusion

Portfolios may be held by individual investors and/or managed by financial professionals, hedge funds, banks and other financial institutions. It is a generally accepted principle that a portfolio is designed according to the investor's risk tolerance, time frame and investment objectives. In this study the researchers should collect data from various investors like conservative, moderately conservative, Aggressive and moderately aggressive. Moreover, investor’s risk tolerance varies on the basis of age, sex, income; financial goals and so on. At the Same time researchers to use the TORA tool to analyze the input-output of Efficiency of portfolio investors in their financial risk tolerance.
Reference

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