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RESEARCH ARTICLE

Danger Can Never Be Overcome Without Taking Financial Risk Tolerance: Data Envelopment Analysis

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Abstract

According to Warren Edward Buffett "RISK COMES FROM NOT KNOWING WHAT YOU'RE DOING." Portfolio is a financial term denoting a collection of investments held by an investment company, hedge fund, financial institution or individual. (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, Postgre SQL, and Teradata databases has been added since the initial launch.

In this paper the researchers wish to study the efficiency of portfolio investors in their financial risk tolerance using Data Envelopment Analysis.

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Introduction

According to Warren Edward Buffett "RISK COMES FROM NOT KNOWING WHAT YOU'RE DOING." Risk is the potential that a chosen action or activity including the choice of inaction will lead to a loss an undesirable outcome. The notion implies that a choice having an influence on the outcome exists or existed. Potential losses themselves may also be called "risks". Almost any human endeavor carries some risk, but some are much more risky than others. (Oxford English Dictionary) Risk and return are moving in the same direction. When the risk is low, return is also low, when the risk is medium, return is also medium and when the risk is high, the return is also high. Tolerance of risk is the order of the day.

Portfolio is a financial term denoting a collection of investments held by an investment company, hedge fund, financial institution or individual. (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).

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Review of Literature

Eiteman W.J., C.C. Dice, and D.K. Eiteman, 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.

Statement of the Problem

The purpose of this study is to introduce Data Envelopment Analysis as a tool for assessment of financial risk tolerance. The main objective is to use DEA on a set of Risk tolerance questions. No research can be found in the literature using DEA in such an application. By applying DEA the most risk tolerant individuals are expected to create a limit. Other individuals will be positioned on one side of the limit such that their distance from limit shows their relative risk tolerance. Those who are most risk averse will be placed the farthest from the limit.

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
- (i) Income
- (ii) Marital Status
- (iii) Financial Support and

3. to use the TORA tool to analyze the following Outputs namely

- (i) Risk
- (ii) Willingness to take Financial Risks Inflation
- (iii) Risk vs. reward
- (iv) Knowledge of risk
- (v) High degree of risk
- (vi) Risk And Return

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.

For the given output **Table- 01**, the efficiency of Risk Tolerance of portfolio investors in their risks in a financial context (background) is unit four, Uncertainty is efficient, None, Thrill, Opportunity, Danger are inefficient.

The efficiency of Risk Tolerance of portfolio investors in their risks in a financial context is unit four, Uncertainty is efficient
As per TORA result 0.0368 under Conservative Investor Categories, 0.1621 under Moderately Conservative Investor, 0.2682 under Moderate, 0.3253 under Moderate Aggressive Investor categories and 0.6942 under Aggressive Investor categories in their Risks.

For the given output **Table- 02**, the efficiency of Risk Tolerance of portfolio investors in their willingness to take Financial Risks is unit three, Average risk taker is efficient, Extremely low risk taker, Low risk taker, High risk taker, Extremely high risk taker are inefficient.

The efficiency of Risk Tolerance of portfolio investors in their willingness to take Financial Risks is unit three, Average risk taker is efficient.
As per TORA result 0.1051 under Conservative Investor Categories, 0.1782 under Moderately Conservative Investor, 0.2815 under Moderate, 0.5677 under Moderate Aggressive Investor categories and 0.8671 under Aggressive Investor categories in their willingness to take Financial Risks.

For the given output **Table- 03**, the efficiency of Risk Tolerance of portfolio investors in their Risk vs. Reward is unit four, Agree is efficient, Strongly disagree, Disagree, Neutral, Strongly agree are inefficient.

The efficiency of Risk Tolerance of portfolio investors in their Risk vs. Reward is unit four, Agree is efficient.

As per TORA result 0.0588 under Conservative Investor Categories, 0.3261 under Moderately Conservative Investor, 0.3573 under Moderate, 0.4357 under Moderate Aggressive Investor categories and 0.8216 under Aggressive Investor categories in their Risk vs. Reward.

For the given output **Table- 04**, the efficiency of Risk Tolerance of portfolio investors in their Knowledge of Risk is unit four, Agree is efficient, Strongly disagree, Disagree, Neutral, Strongly agree are inefficient.

The efficiency of Risk Tolerance of portfolio investors in their Knowledge of Risk is unit four, Agree is efficient.

As per TORA result 0.2033 under Conservative Investor Categories, 0.2370 under Moderately Conservative Investor, 0.2700 under Moderate, 0.3707 under Moderate Aggressive Investor categories and 0.7031 under Aggressive Investor categories in their Knowledge of Risk.

For the given output **Table- 05**, the efficiency of Risk Tolerance of portfolio investors in their High Degree of Risk is unit Seven, Portfolio seven is efficient, Portfolio one to six are inefficient.

The efficiency of Risk Tolerance of portfolio investors in their High Degree of Risk is unit Seven, Portfolio seven is efficient.

As per TORA result 0.1479, 0.1648 under Conservative Investor Categories, 0.2664, 0.2691 under Moderately Conservative Investor, 0.3297 under Moderate, 0.3315 under Moderate Aggressive Investor categories and 0.4901 under Aggressive Investor categories in their High Degree of Risk.

For the given output **Table- 06**, the efficiency of Risk Tolerance of portfolio investors in their Risk and Return is unit Three, 31 percent -60 percent is efficient, None, one percent – 30 percent, 61 percent – 90 percent, Above 91 percent are inefficient.

The efficiency of Risk Tolerance of portfolio investors in their Risk and Return is unit Three, 31 percent - 60 percent is efficient.

As per TORA result 0.1345 under Conservative Investor Categories, 0.2806 under Moderately Conservative Investor, 0.4045 under Moderate, 0.5489 under Moderate Aggressive Investor categories and 0.6309 under Aggressive Investor categories in their Risk and Return.

C. Finding of the Study

1. The efficiency of Risk Tolerance of portfolio investors in their risks in a financial context (back ground), is unit four, Uncertainty is efficient. As per TORA result 0.0368 under Conservative Investor Categories, 0.1621 under Moderately Conservative Investor, 0.2682 under Moderate, 0.3253 under Moderate Aggressive Investor categories and 0.6942 under Aggressive Investor categories in their Risks.

2. The efficiency of Risk Tolerance of portfolio investors in their willingness to take Financial Risks is unit three, Average risk taker is efficient. As per TORA result 0.1051 under Conservative Investor Categories, 0.1782 under Moderately Conservative Investor, 0.2815 under Moderate, 0.5677 under Moderate Aggressive Investor categories and 0.8671 under Aggressive Investor categories in their willingness to take Financial Risks.

3. The efficiency of Risk Tolerance of portfolio investors in their Risk vs. Reward is unit four, Agree is efficient. As per TORA result 0.0588 under Conservative Investor Categories, 0.3261 under Moderately Conservative Investor, 0.3573 under Moderate, 0.4357 under Moderate Aggressive Investor categories and 0.8216 under Aggressive Investor categories in their Risk vs. Reward.

4. The efficiency of Risk Tolerance of portfolio investors in their Knowledge of Risk is unit four, Agree is efficient. As per TORA result 0.2033 under Conservative Investor Categories, 0.2370 under Moderately Conservative Investor, 0.2700 under Moderate, 0.3707 under Moderate Aggressive Investor categories and 0.7031 under Aggressive Investor categories in their Knowledge of Risk.

5. The efficiency of Risk Tolerance of portfolio investors in their High Degree of Risk is unit Seven, Portfolio seven is efficient. As per TORA result 0.1479, 0.1648 under Conservative Investor Categories, 0.2664, 0.2691 under Moderately Conservative Investor, 0.3297 under Moderate, 0.3315 under Moderate Aggressive Investor categories and 0.4901 under Aggressive Investor categories in their High Degree of Risk.

6. The efficiency of Risk Tolerance of portfolio investors in their Risk and Return is unit Three, and 31 percent 60 percent is efficient. As per TORA result 0.1345 under Conservative Investor Categories, 0.2806 under Moderately Conservative Investor, 0.4045 under Moderate, 0.5489 under Moderate Aggressive Investor categories and 0.6309 under Aggressive Investor categories in their Risk and Return.

TABLE – 01 EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR RIKS

Source: Field Data

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

TABLE – 02 EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR WILLINGNESS TO TAKE FINANCIAL RISKS

INPUT	OUTPUT
V1 Sex = 100	U1 Strongly disagree = 2
V2 Age = 302	U2 Disagree = 14
V3 Religion = 202	U3 Neutral = 17
V4 Qualification = 357	U4 Agree = 42
V5 Nature of Place of Birth = 157	U5 Strongly agree = 25
V6 State = 166	
V7 Occupation = 223	
V8 Income = 232	
V9 Martial Status = 154	
V10 Financial Support = 221	

Source: Field Data

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

T.NO	U1	U2	U3	U4	U5	BEST	VARIABLE
2.	0.2815	0.5677	0.8671	0.1051	0.1782	0.8671	U3

INPUT	OUTPUT
V1 Sex = 100	U1 None= 6
V2 Age = 302	U2 Thrill = 13
V3 Religion = 202	U3 Opportunity= 25
V4 Qualification = 357	U4 Uncertainty = 43
V5 Nature of Place of Birth = 157	U5 Danger = 13
V6 State = 166	
V7 Occupation = 223	
V8 Income = 232	
V9 Martial Status = 154	
V10 Financial Support = 221	

TABLE – 03 EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR RISK VS. REWARD

T.NO	U1	U2	U3	U4	U5	BEST	VARIABLE
1.	0.1621	0.0368	0.3253	0.6942	0.2682	0.6942	U4

Source: Field Data

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

TABLE – 04 EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR

T.NO	U1	U2	U3	U4	U5	BEST	VARIABLE
3.	0.0588	0.3261	0.3573	0.8216	0.4357	0.8216	U4
INPUT					OUTPUT		
V1 Sex = 100					U1 Portfolio 1 = 09		
V2 Age = 302					U2 Portfolio 2 = 14		
V3 Religion = 202					U3 Portfolio 3 = 20		
V4 Qualification = 357					U4 Portfolio 4 = 18		
V5 Nature of Place of Birth = 157					U5 Portfolio 5 = 11		
V6 State = 166					U6 Portfolio 6 = 06		
V7 Occupation = 223					U7 Portfolio 7 = 22		
V8 Income = 232							
V9 Martial Status = 154							

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INPUT					OUTPUT		
V1 Sex = 100					U1 Strongly disagree = 10		
V2 Age = 302					U2 Disagree = 16		
V3 Religion = 202					U3 Neutral = 22		
V4 Qualification = 357					U4 Agree = 37		
V5 Nature of Place of Birth = 157					U5 Strongly agree = 15		
V6 State = 166							
V7 Occupation = 223							
V8 Income = 232							
V9 Martial Status = 154							
V10 Financial Support = 221							

Source: Field Data

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

TABLE – 05 EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR HIGH DEGREE OF RISK

INPUT					OUTPUT		
V1 Sex = 100					U1 Extremely low risk taker = 12		
V2 Age = 302					U2 Low risk taker = 29		
V3 Religion = 202					U3 Average risk taker = 45		
V4 Qualification = 357					U4 High risk taker = 06		
V5 Nature of Place of Birth = 157					U5 Extremely high risk taker = 08		
V6 State = 166							
V7 Occupation = 223							
V8 Income = 232							
V9 Martial Status = 154							
V10 Financial Support = 221							

V10 Financial Support = 221	
Source: Field Data	

T.NO	U1	U2	U3	U4	U5	BEST	VARIABLE
6.	0.2806	0.5489	0.6309	0.4045	0.1345	0.6309	U3

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

TABLE – 06 EFFICIENCY OF RISK TOLERANCE OF PORTFOLIO INVESTORS IN THEIR RISK AND RETURN

Source: Field Data

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

T.NO	U1	U2	U3	U4	U5	U6	U7	BEST	VARIABLE
5.	0.1648	0.2691	0.3315	0.3297	0.2664	0.1479	0.4901	0.4901	U7

Conclusion

Portfolio is a financial term denoting a collection of investments held by an investment company, hedge fund, financial institution or individual. Investors are of different types. 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.

For the given output the efficiency of Risk Tolerance of portfolio investors in their risks in a financial context (back ground) is uncertainty is efficient at the same time most of an investors are efficient in their

INPUT					OUTPUT				
V1 Sex = 100					U1 None= 11				
V2 Age = 302					U2 1% - 30% = 24				
V3 Religion = 202	U1	U2	U3	U4	U5 31% -60%	BEST 36	VARIABLE		
V4 Qualification = 357	0.2033	0.3707	0.2370	0.7031	U4 61%-90% = 22	0.7031	U4		
V5 Nature of Place of Birth = 157					U5 Above 91% = 07				
V6 State = 166									
V7 Occupation = 223									
V8 Income = 232									
V9 Martial Status = 154									
V10 Financial Support = 221									

knowledge of Risk

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