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Data Envelopment Analysis and Italian Mutual Funds

MASTER'S DEGREE IN FINANCE AND RISK MANAGEMENT

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Overview

1. Objective
2. Literature Review
3. Methodology and Data
4. Results and Insights
5. Conclusions

Objective

Is there a better method than traditional indices to evaluate the efficiency of mutual funds?

Traditional Indices

- Indice di Sharpe
- Indice di Treynor
- Alpha di Jensen

Data Envelopment Analysis

Literature Review

Farrell

1957

"The Measurement of Productive Efficiency"

Introduction to the concept of efficiency

Charnes; Cooper; Rhodes

1978

"Measuring the Efficiency of Decision Making Units"

DEA Model:

- **Constant Returns to Scale**
- **Input-oriented**

Murthi; Choi; Desai

1997

"Efficiency of Mutual Funds and Portfolio Performance Measurement: A Non-Parametric Approach"

First application of DEA in finance

Basso; Funari

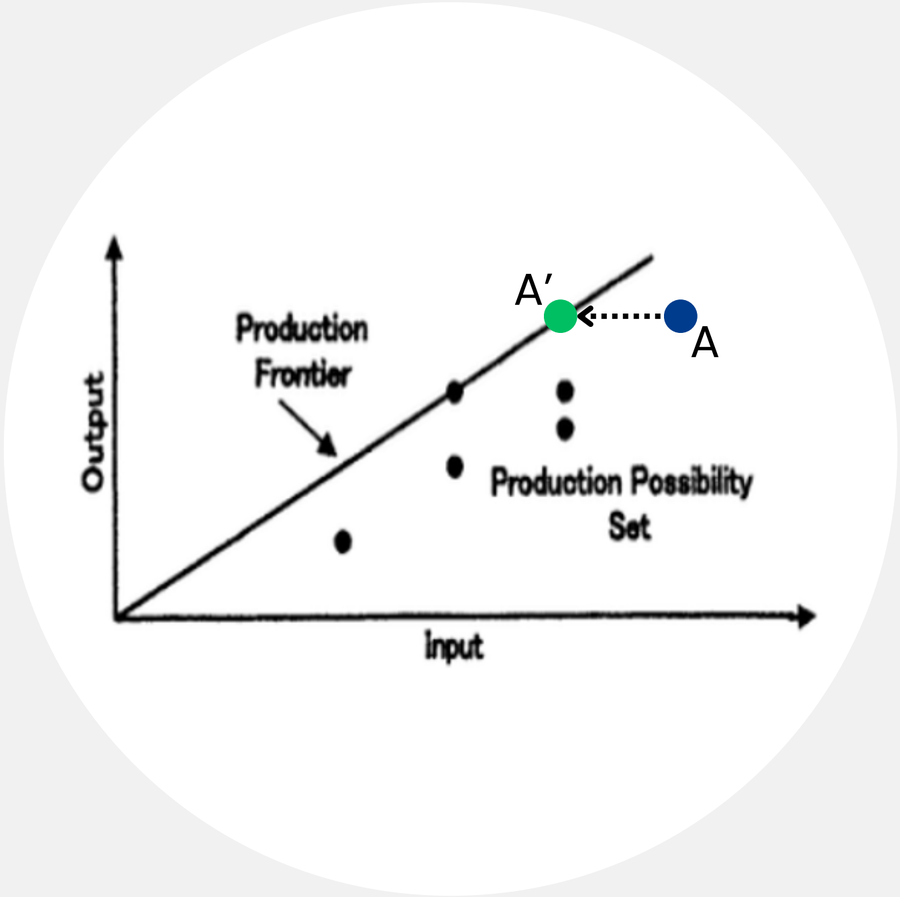
2001

"A Data Envelopment Analysis Approach to Measure the Mutual Fund Performance"

Application of the DEA model to Italian mutual funds

Methodology

Phases of Data Envelopment Analysis



- Definition of Inputs and Outputs
- Calculation of fund efficiency
- Identification of optimal weights
- Calculation of efficient combinations

Dataset

Period: 01/01/2019 - 30/06/2021

3 Fund Categories

- Italian Equity Funds(22)
- Euro Government Bond Funds(15)
- Euro Moderate Balanced Funds(15)

3 Input

- Standard Deviation
- Beta
- Entry Fee

1 Output

- Expected Return

Results

Average Efficiency Index by Category

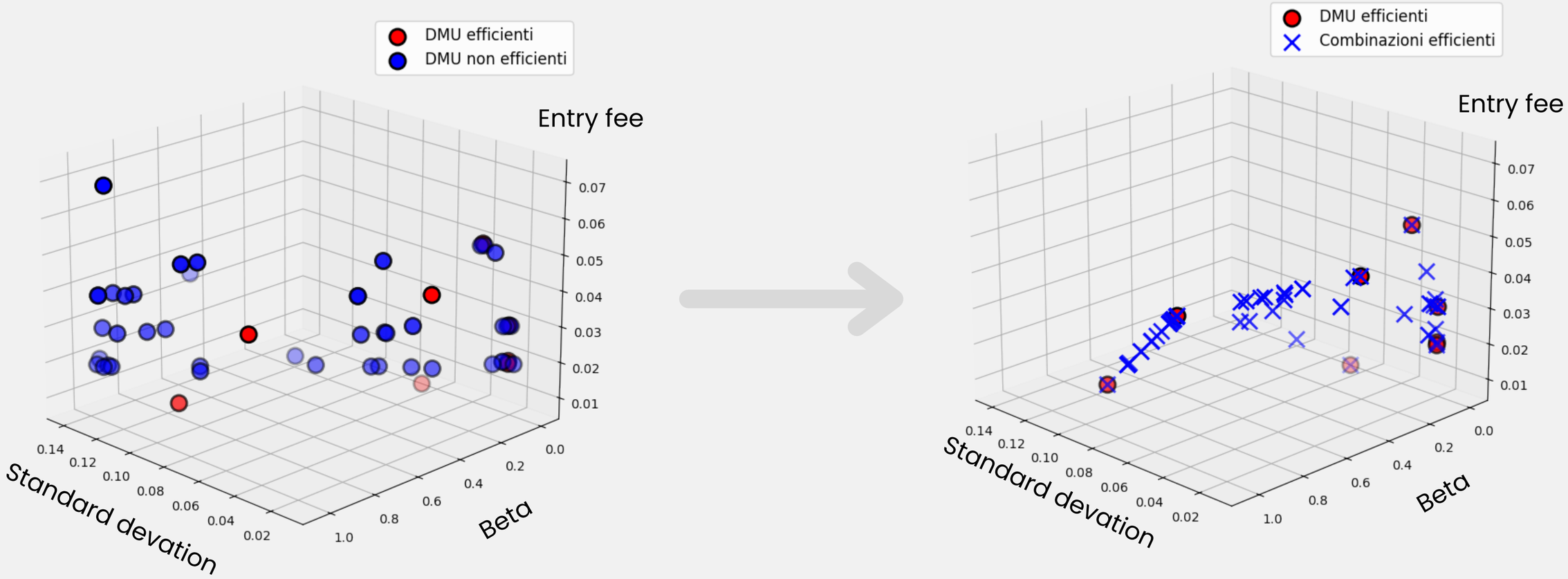
Italian Equity Funds

Euro Government Bond Funds

Euro Moderate Balanced Funds

Results

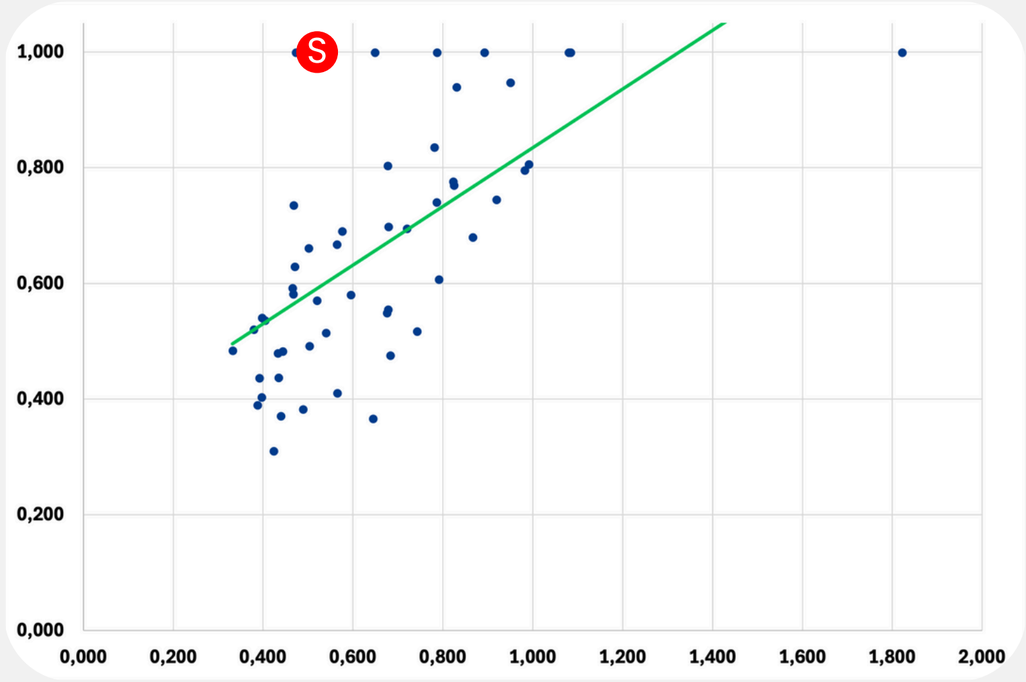
From Decision Making Units to Efficient Combinations



Results

DEA vs. Traditional Indices

DEA Index

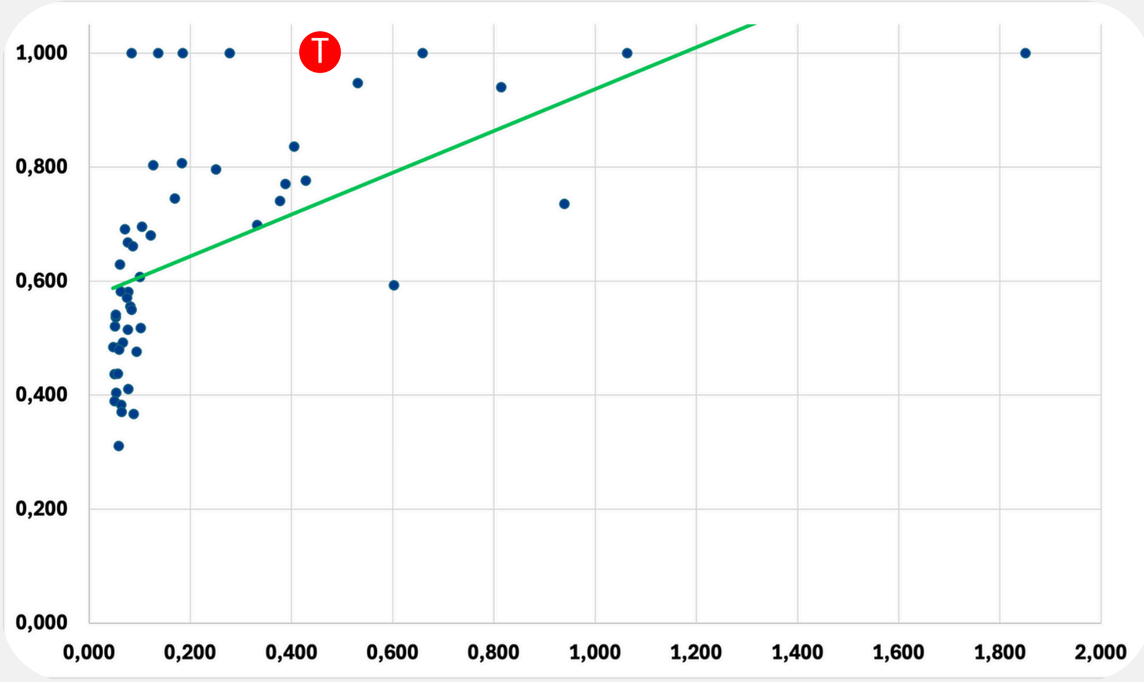


Sharpe Ratio

Linear Correlation: 0.639

S *Pictet-EUR Government Bonds I*
Beta: 0.01 vs. 0.50 average

DEA Index



Treynor Ratio

Linear Correlation: 0.585

T *Epsilon Fund - Euro Bond Class Unit R Eur Accumulation*
Entry Fee: 1.50% vs. 3.00% average

Further Analysis

Efficiency Index for Passive Funds - ETFs

0.00%

Entry Fees

Xtrackers II Eurozone Government Bond UCITS ETF 1C

iShares FTSE MIB UCITS ETF

Further Analysis

Efficiency Index for ESG Funds

33 **Non-ESG Mutual Funds**

19 **ESG Mutual Funds**

Non-ESG Mutual Funds

ESG Mutual Funds

Historical Comparison

Period	Equity Efficiency*	Bond Efficiency*	Balanced Efficiency*	DEA-Sharpe Correlation	DEA-Treynor Correlation
01/01/1997 - 30/06/1999**	**0.907**	0.439	**0.900**	**0.727**	**0.624**
01/01/2019 - 30/06/2021	0.595	**0.863**	0.687	0.639	0.585

*Intra-category efficiency measurement
**Basso, A., & Funari, S. (2001). *A data envelopment analysis approach to measure the mutual fund performance*

Why DEA?

Advantages Over Traditional Indices

Multi-input and multi-output analysis

Inclusion of entry costs

Measurement of relative efficiency and customized benchmarks

Thank you

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