Analyzing the Impact of COVID-19 on Pension Fund Switching in Chile: A Probit and Logit Approach

Caso #1. Modelamiento Binario.

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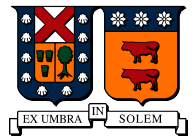
25 de octubre de 2024



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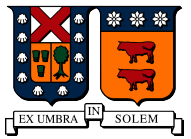


Contenido

Grupal activity

Actividad 2. Grupal.

Analice el paper

Kristjanpoller, W. D., & Olson, J. E. (2015). The effect of financial knowledge and demographic variables on passive and active investment in Chile's pension plan. *Journal of Pension Economics & Finance*, *14*(3), 293-314.

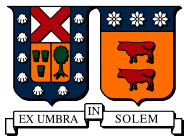
Busque data en pensiones.cl u otro organismo y replique parte del paper o algún comportamiento asociado a los afiliados de las AFP o un caso similar en otro país u otro tema que se pueda abordar con la misma metodología.

Figura 1: Screenshot of the assigned work.

Principal ideas of the paper

About *The effect of financial knowledge and demographic variables on passive and active investment in Chile's pension plan*:

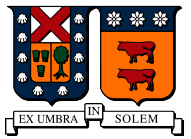
- Constribution to the study of defined contribution (DC) retirement plans.
- Literature review of DC retirement plans.
- Provide an explanation of the Chilean Pension Fund System.
- Source of information: Survey of Social Protection (SSP).
- Financial knowledge and demographic factors influenced Chile's pension holders' choice.
- Econometric models used: probit and ordered probit model.



About the cited paper

Principal insights and results:

- About one third of Chileans held default funds in 2009.
- Younger people, men, people with lower incomes, and people with low financial knowledge were more likely to choose the default.
- Nearly three quarters of active investors chose more risky funds that the defaults for their age group.
- Risk taking tended to decrease with age and to increase with income, financial knowledge and risk tolerance.



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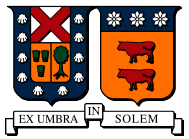
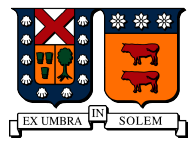


The Idea

- **Global Context**: The COVID-19 pandemic as a catalyst for rethinking financial strategies, especially retirement planning.
- **Existing Research**: Reference to another paper highlighting the dynamics of pension fund behavior during crises.
- **Objective of the Study**: Analyze the behavior of pension fund members during the COVID-19 pandemic (2020-2022) to understand decision-making under pressure.
- **Study Periods**: Comparison between a control group (2018-2019) and the pandemic context (2020-2022).
- **Contribution**: Assess the impact of financial literacy and demographic factors on fund transfers, providing insights into rational versus irrational behaviors in financial decision-making.



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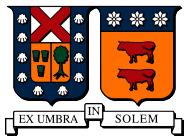
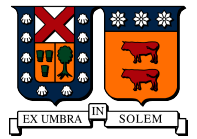


The data

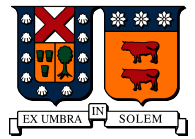
The data is obtained from different sources:

- From `https://www.spensiones.cl`: *base_cambio_fondos.csv* and *caracteristicas_afiliados.csv*
- Other sites: as *https://www.bcentral.cl*, ... are used to obtain the value of UF.
- Dates of interest: From 2020-01-01 to 2022-12-31.



Exploratory Analysis: base_cambio_fondos.csv

The dataframe contains 17,163,217 observations and 10 columns.



Exploratory Analysis: base_cambio_fondos.csv

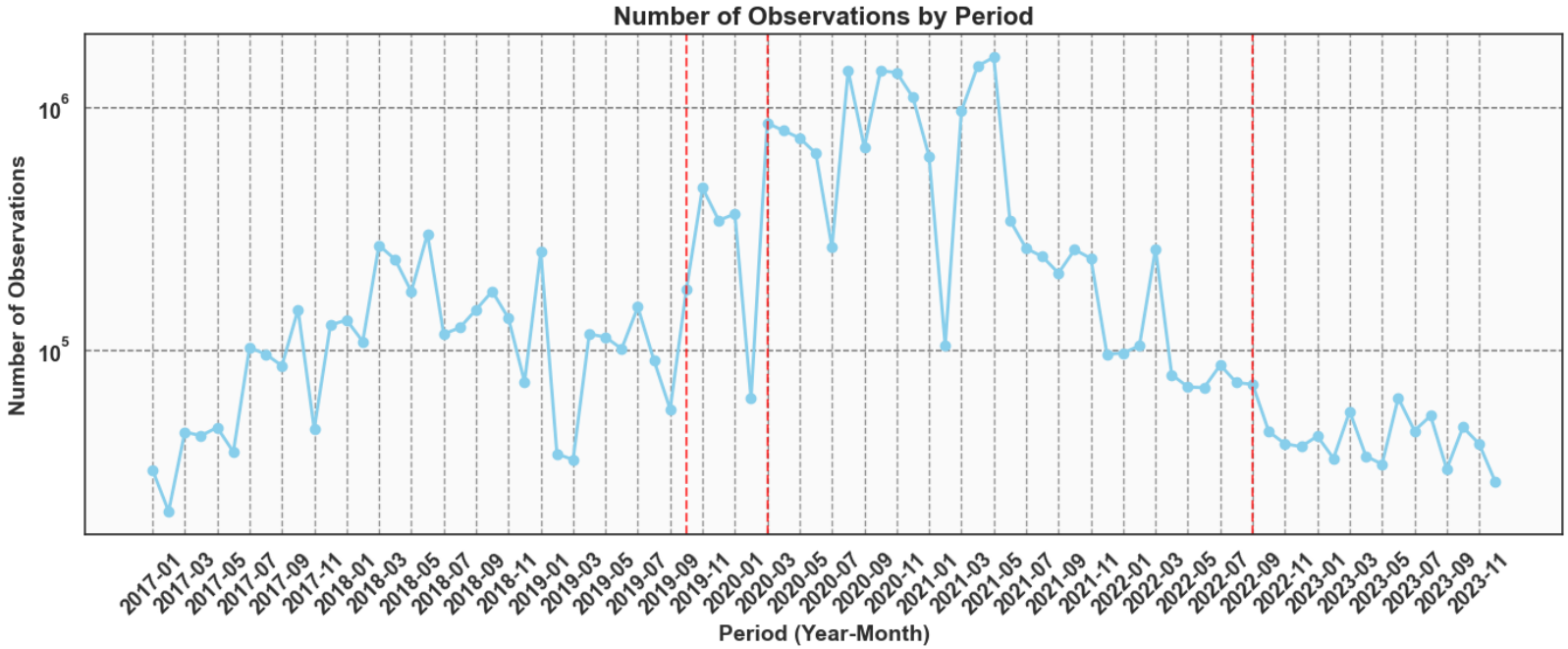


Figura 2: Number of fund change observations over time. The red lines indicate dates related to Protests, the onset of Covid-19 in Chile, and the end of the Covid period.

Exploratory Analysis: base_cambio_fondos.csv

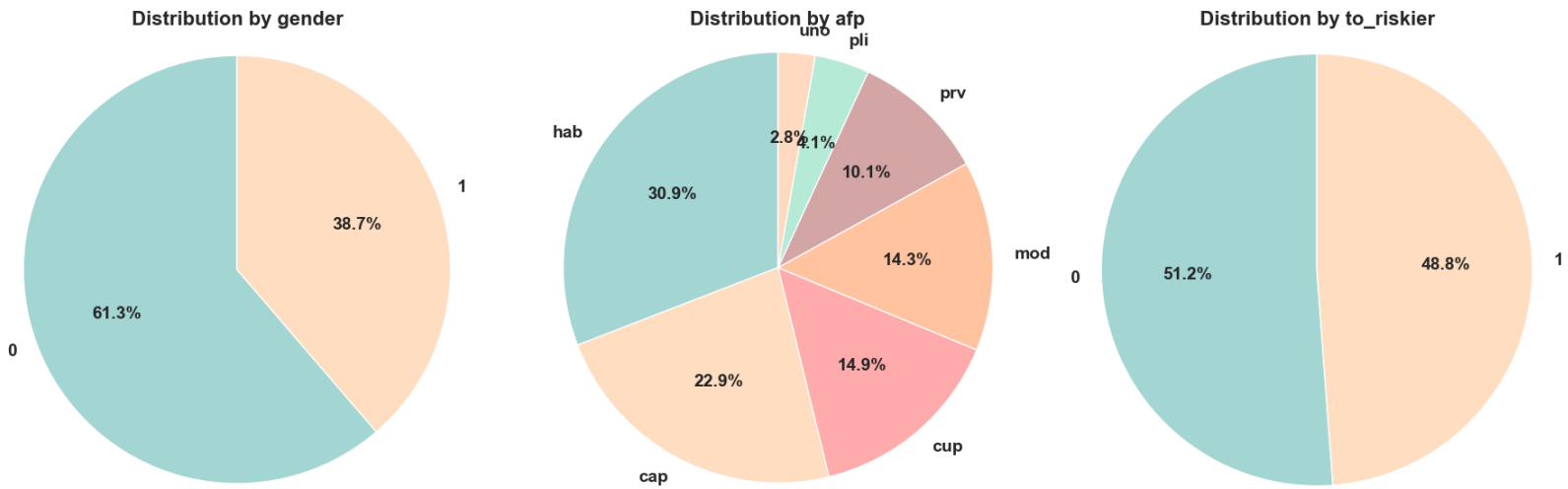


Figura 3: Distribution of selected variables.

Exploratory Analysis: base_cambio_fondos.csv

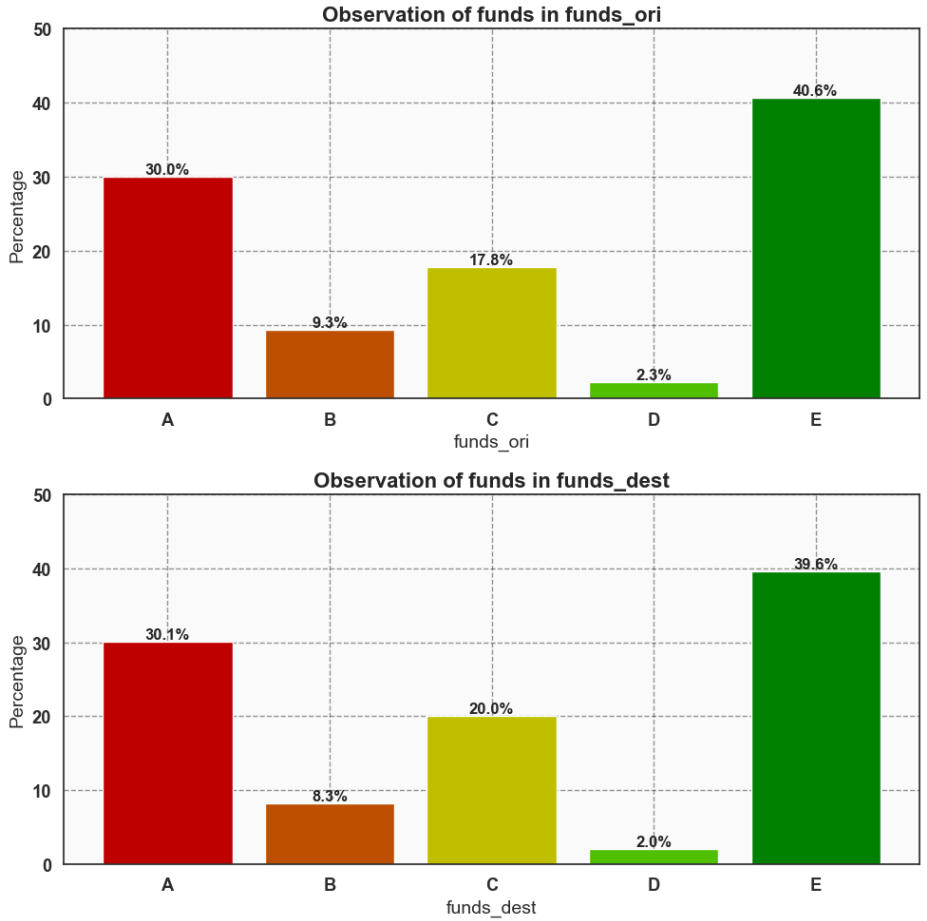


Figura 4: Percentage of each fund in terms of origin or destination.

Exploratory Analysis: base_cambio_fondos.csv

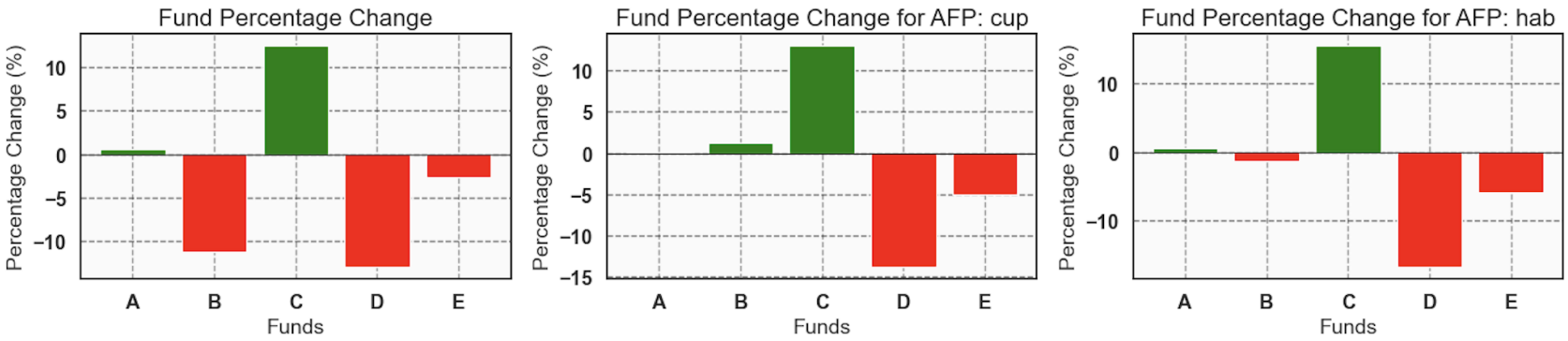


Figura 5: This graph shows the percentage change of people switching pension funds, with inflows (green) and outflows (red) for each fund.

Exploratory Analysis: base_cambio_fondos.csv

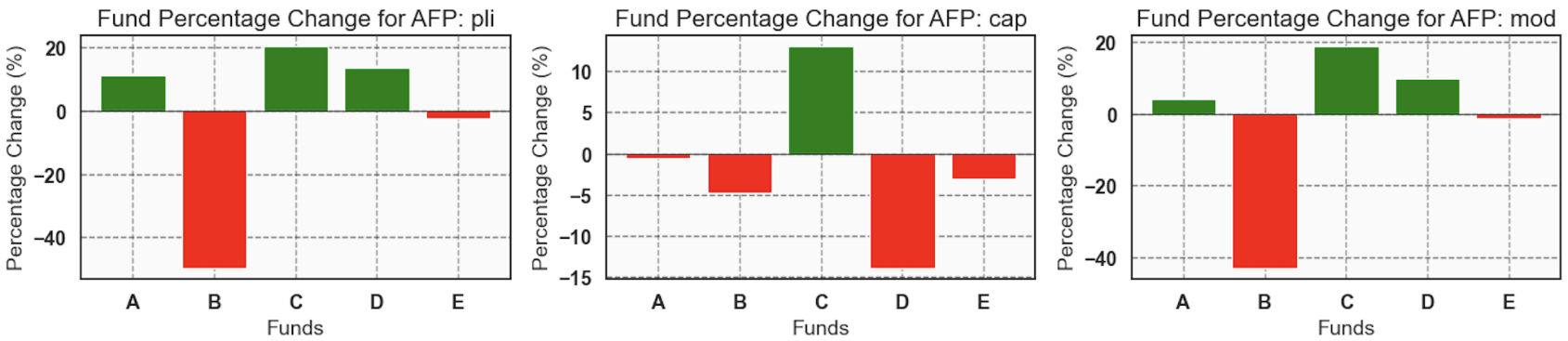


Figura 6: This graph shows the percentage change of people switching pension funds, with inflows (green) and outflows (red) for each fund.

Exploratory Analysis: base_cambio_fondos.csv

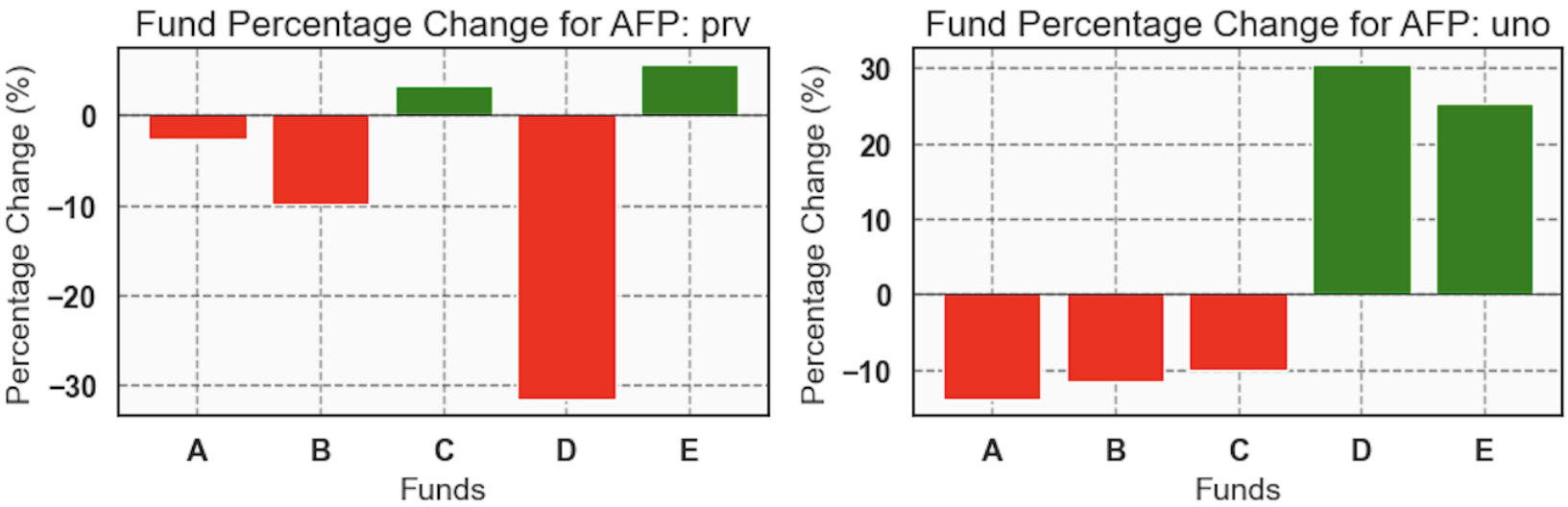


Figura 7: This graph shows the percentage change of people switching pension funds, with inflows (green) and outflows (red) for each fund.

Exploratory Analysis: base_cambio_fondos.csv

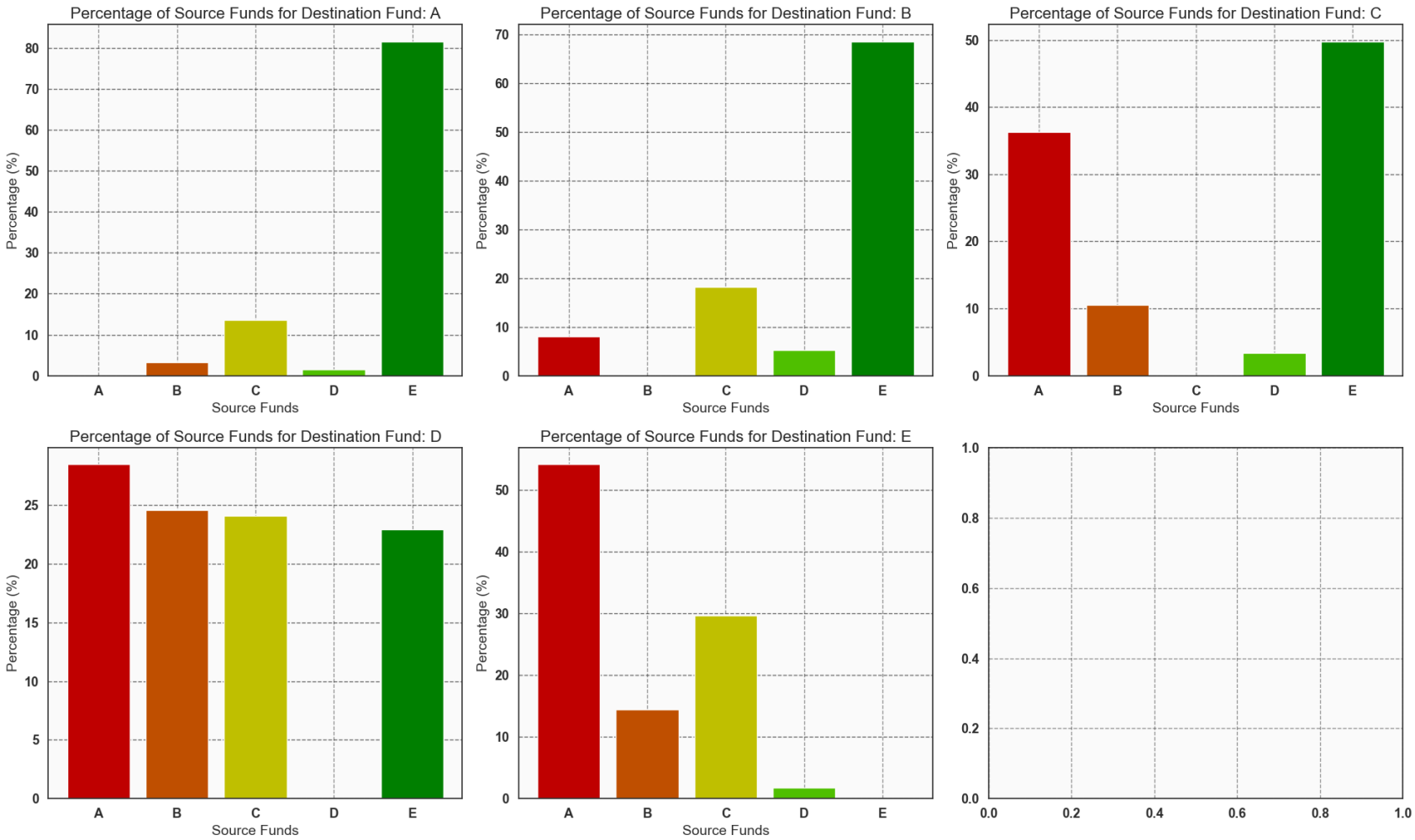


Figura 8: For each destination fund, this shows the distribution of its

Exploratory Analysis: base_cambio_fondos.csv

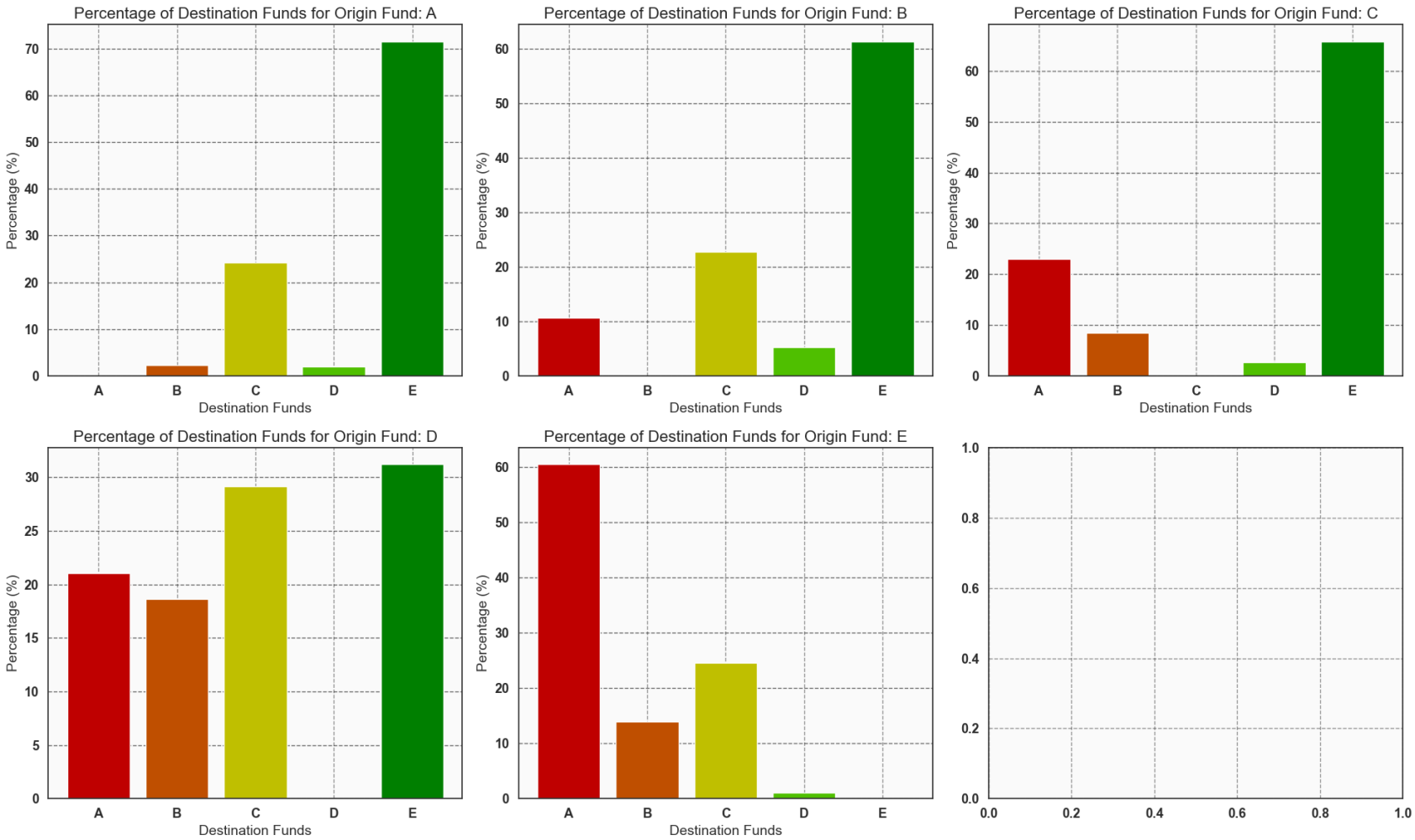


Figura 9: For each origin fund, this shows the distribution of its destination fund

Exploratory Analysis: base_cambio_fondos.csv

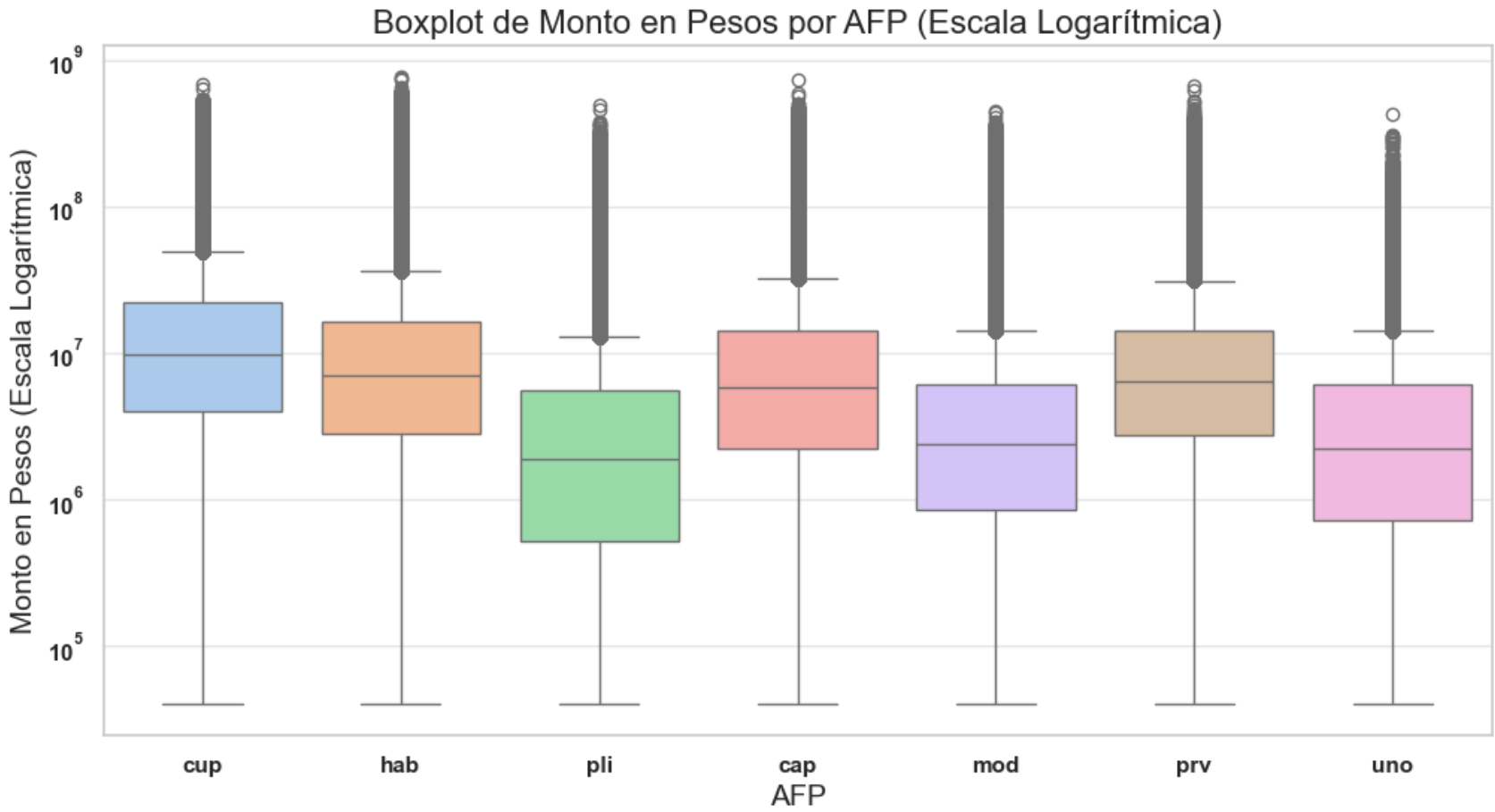


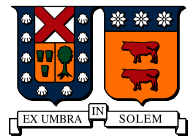
Figura 10: Boxplot of the amout of pesos for each movement grouped by afp.

Setting-up the characteristics

Variable	Description
risk_ori	Original risk profile of the individual: 0: Low Risk 1: High Risk
gender	Gender of the individual: 0: Male 1: Female
$ICEF_i$	Composite Index of Financial Education (Standardized): 0: [0, 25[1: [0, 50[2: [0, 75[3: [0, 100[
age	Age categories: 0: [0, 35[1: [35, 50[2: [50, 65[3: [65, 100]
$amount_i$	Categories of amount transferred (percentiles): 0: [0, 15[1: [15,30[2: [30,45[3: [45,60[4: [60,75[5: [75,90[6: [90,100[
AFP_i	AFP affiliations: 0: AFP Capital 1: AFP Cuprum 2: AFP Habitat 3: AFP Modelo 4: AFP Plan Vital 5: AFP Provida 6: AFP Uno

Table 1: Variable Defitions

Figura 11: Description of variables used in the pension fund study.



Nominal Rentability

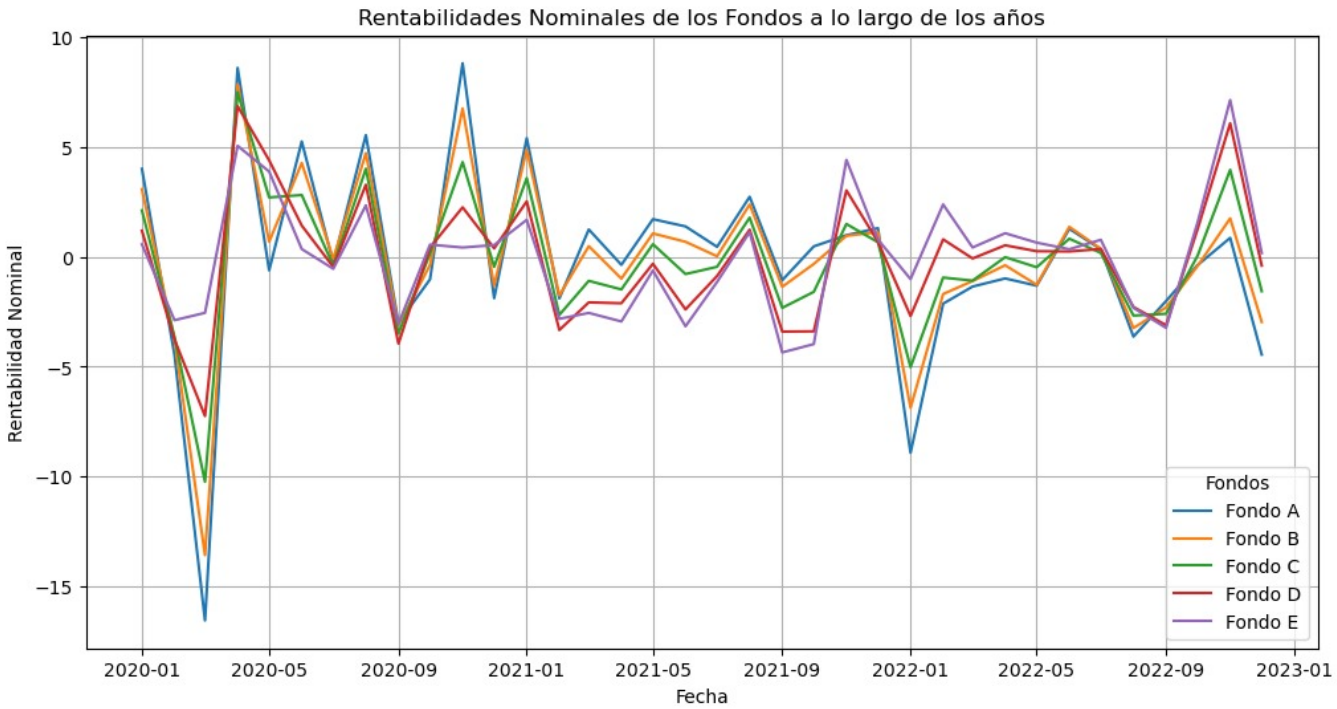


Figura 12: Second Experiment

Optimal and Minimal Variance Portfolio

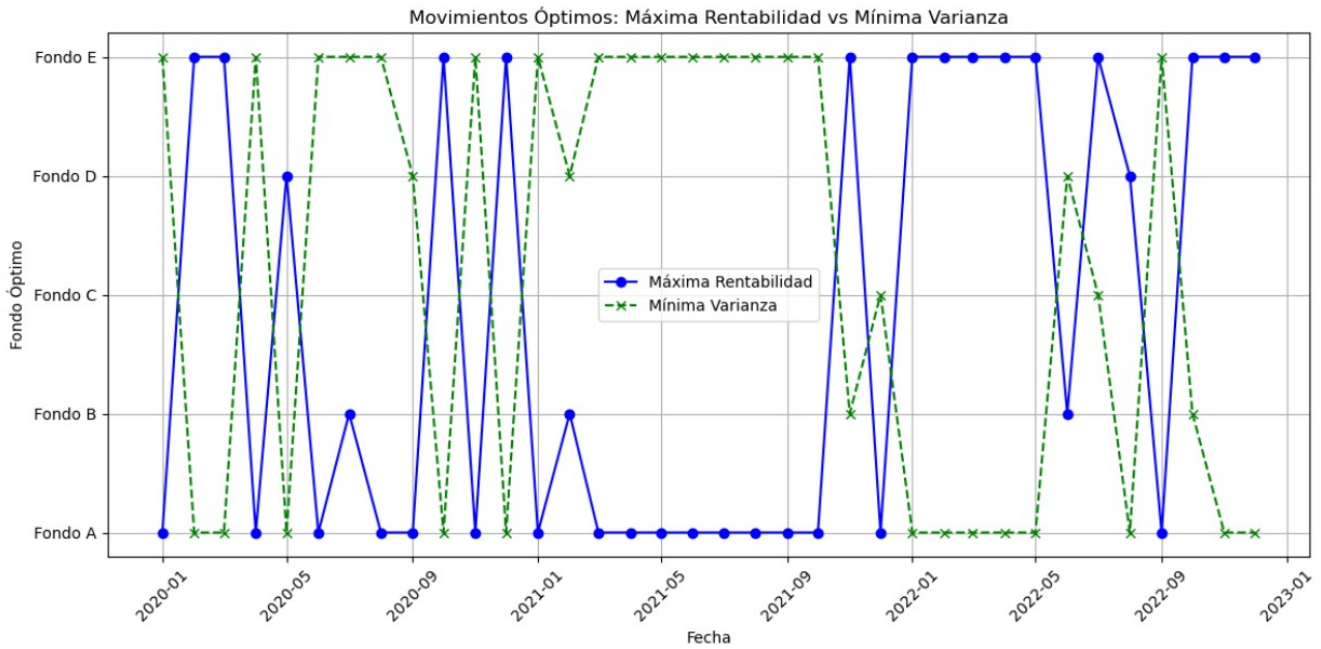


Figura 13: Second Experiment

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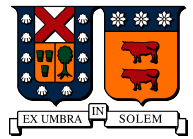


Experiments and Research Questions

Situation under study:

1. Analyze the factors that influence the decision to switch to riskier or safer funds.
2. Identify individuals who make optimal decisions regarding fund changes based on actual profitability[1].

Methods:

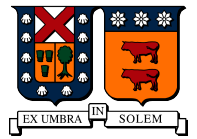
1. Probit and Logit Approach.

[1] Work in process...

Probit model

$$P(Y = 1 \mid X) =$$
$$\Phi\left(\beta_0 + \beta_1 \cdot \text{risk\_ori} + \beta_2 \cdot \text{gender} + \sum_{i=0}^{2} \beta_{3+i} \cdot \text{ICEF}_i + \sum_{i=0}^{2} \beta_{6+i} \cdot \text{age}_i + \sum_{i=0}^{5} \beta_{9+i} \cdot \text{amount}_i + \sum_{i=0}^{5} \beta_{15+i} \cdot \text{AFP}_i\right)$$

Figura 14: Probit Model



Logit model

$$P(Y=1 \mid X) = \frac{1}{1+e^{-\left(\beta_0+\beta_1\cdot \text{risk\_or}+\beta_2\cdot \text{gender}+\sum_{i=0}^{2}\beta_{3+i}\cdot \text{ICEF}_i+\sum_{i=0}^{2}\beta_{6+i}\cdot \text{age}_i+\sum_{i=0}^{5}\beta_{9+i}\cdot \text{amount}_i+\sum_{i=0}^{5}\beta_{15+i}\cdot \text{AFP}_i\right)}}$$

Figura 15: Logit Model

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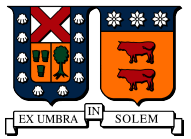


About Probit and Logit model

Variable	Probit Coefficient	P-Value	Logit Coefficient	P-Value
const	-0.1168	0.353	-0.2695	0.216
risk_ori	-2.8067	0.000	-5.0412	0.000
gender	-0.0380	0.000	-0.0713	0.000
$ICEF_0$	0.1508	0.230	0.2464	0.257
$ICEF_1$	0.1444	0.251	0.2412	0.268
$ICEF_2$	0.1300	0.251	0.2506	0.226
age_0	0.6315	0.000	1.0638	0.000
age_1	0.4933	0.000	0.8297	0.000
age_2	0.6644	0.000	1.0443	0.000
$amount_0$	0.0667	0.000	0.1657	0.000
$amount_1$	0.0932	0.000	0.2348	0.000
$amount_2$	0.0820	0.000	0.2062	0.000
$amount_3$	0.1334	0.000	0.3326	0.000
$amount_4$	0.0638	0.000	0.1593	0.000
$amount_5$	0.0773	0.000	0.1933	0.000
AFP_0	0.2834	0.000	0.5936	0.000
AFP_1	0.3177	0.000	0.7733	0.000
AFP_2	0.2935	0.000	0.5522	0.000
AFP_3	0.2963	0.000	0.5644	0.000
AFP_4	0.4156	0.000	0.7495	0.000
AFP_5	0.2228	0.000	0.4030	0.000
Number	16992595	-	16992595	-
Log likelihood	-6.0281e+07	-	-6.0318e+07	-
Pseudo R^2	0.4880	-	0.4877	-

Table 2: Coefficients and P-Values of Probit and Logit Regressions

Figura 16: Probit and Logit Model

About second experiment

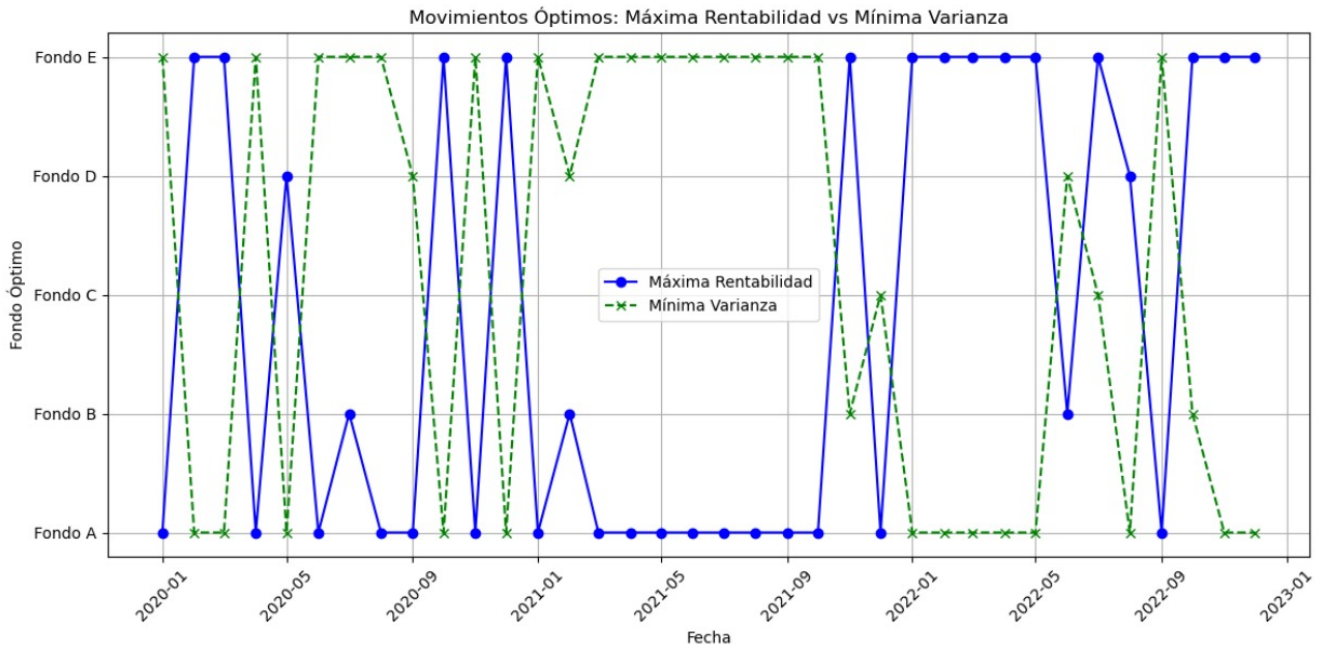


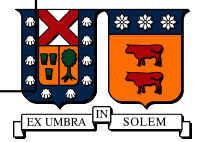
Figura 17: Second Experiment

Principal insights

- Most relevant variables suggest that investment decisions towards riskier funds are influenced by risk aversion, age, and available capital.
- Individuals coming from risky funds tend to be more cautious and less likely to increase their exposure to risk.
- Decisions also vary by gender and age, with larger investment amounts associated with a higher probability of transferring to riskier funds.

Conclusion 2nd Experiment

Característica	Top 5 % Rentabilidad	Top 5 % Varianza
AFP		
HABITAT	35.60 %	36.71 %
CAPITAL	23.14 %	22.48 %
CUPRUM	19.56 %	19.09 %
Sexo		
M	71.72 %	70.12 %
F	28.28 %	29.88 %
Edad (media)	54 años	54 años
Región		
13	46.14 %	46.59 %
5	10.41 %	10.79 %
8	9.72 %	9.02 %



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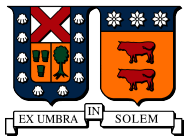


Conclusion

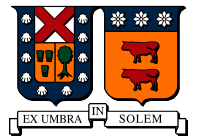
Here are some ideas:

- The Covid period has significant implications for the behavior of individuals' pension funds.
- Studying and understanding these events is important for comprehending how these funds are managed in unconventional situations.
- There are relationships between individuals' characteristics, the number of fund changes, and profitability.

Possible Next Steps

- Study the relationship between the number of transactions, fund changes, and profitability[2].
- Analyze the relationship between an individual's age, their risk tolerance, and their returns.
- Examine statistical and financial differences in the magnitude of fund movements between typical and Covid-19 contexts.
- Repeat the analysis using 2018-2019 as a control period to compare results in a non-Covid environment.

[2]Supported by studies, such as: https://doi.org/10.1017/s147474722200018x



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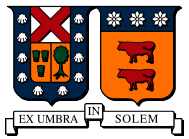

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[9] Justine Hastings, Brigitte Madrian, and William Skimmyhorn. Financial literacy, information, and demand elasticity: Survey and experimental evidence from mexico. *American Economic Review*, 101(3):304–309, 2011.

Figura 18: References