Replicating the "Money Illusion" Effect: Exploring Gender Influences within a Brazilian Sample*

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Money illusion as the tendency to overlook the impact of inflation which focusing on nominal values identified by Shafir, Diamond, and Tversky (1997). This study reproduce four scenarios from research where participants face financial decisions influenced by money illusion in various situations such as earnings, transactions, and contracts,under the background of Brazilian context, where in various situations such as transactions, transactions and earnings that participants face financial decisions influenced by money illusion. The cross-sectional and pre-registered research is based on 372 Brazilian participants in mobile phones or computers by using chi-square tests assessed money illusion. The results indicate that participants' tend to choose financially advantages opportunities which influenced by the framing of terms (real, nominal, or neutral). After we replicate across all four scenarios, the findings suggest that the money illusion effect transcend cultural boundaries, supported by replication within a different background of cultural context.

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*Code and data supporting this analysis are available at https://github.com/TEJMaster/Student-Replication-For-Money-Illusion.git

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1 Introduction

Money illusion refers to a cognitive bias where individuals tend to assess the value of money solely based on its nominal value. The real value of money is the nominal value of money plus the inlation rate. thereby overlooking the impact of inflation. This bias can lead to various consequences, such as reluctance to sell assets due to perceived nominal losses, misunderstanding wage increases, and more.

The influential 1997 study by Shafir and colleagues(Shafir, Diamond, and Tversky 1997) has significantly impacted on economic psychology and behavioral economics which introduced the concept of money illusion. The authors argued that money illusion could explain phenomena like inflexible wages and contracts which contrary to traditional economic theories assuming rationality in decision-making.

When shopping, people often ignore information that is clearly distorted by inflation and impulsively raise the psychological price above the actual price, which is the money illusion. Money illusions can lead potential buyers to believe that house prices will always rise, and thus that real estate is a good investment. Robert J. Shiller, a professor of economics at Yale University in the United States, believes that it is the false logic caused by the monetary illusion that led to the real estate bubble, "people mostly only remember the price of a few years ago when they bought a house, but often forget the price of other goods, andmistakenly believe that house prices have risen more than other prices." Thus exaggerating the investment potential of real estate"(Shiller, n.d.).

For decades, economists have debated whether the money illusion is real or, more generally, whether there are irrational influences in economic transactions. Milton Friedman, the famous monetary theorist, assumed that employers and consumers were rational, paying wages or buying goods with inflation in mind. In other words, they can accurately judge the true value of a commodity(Friedman 2010).

Recognizing the importance of testing theories in different contexts for generalizability, our study aims to investigate the presence of the money illusion effect in a Brazilian cultural setting. Specifically, we aim to replicate four problems proposed by Shafir and colleagues (Shafir, Diamond, and Tversky 1997)and examine if Brazilians exhibit money illusion biases.

In this paper, our hypothesis are across all four problems: in problem 1, individuals inclined to perceive wage increases significantly in real term even if it is small in nominal terms; In problem 2, individuals will evaluate house deals based on nominal gains rather than real gains; In problem 3, participants will be less likely to purchase new items rather than second hand items when prices increase nominally; In problem 4, individuals might prefer riskier contracts in real terms over safer options presented in nominal terms.

2 Data

The raw dataset for our study, derived from the replication of the "Money Illusion" effect among Brazilian researchers (Santiago et al. 2023), is archived and accessible through the Open Science Framework (OSF). This dataset encompasses the complete set of responses collected through our online survey, including socio-demographic information, responses to the money illusion problems, and verification question answers. Interested researchers can access the dataset for further analysis or replication studies at the following URL: https://osf.io/48pqu/.

2.1 Dataset Description

The data were collected via an online survey platform and include a range of variables:

Socio-demographic Information: Participants provided details about their educational background, area of study (if applicable), average monthly family income, and the number of people living off this income.

Economic Decision-Making Scenarios: The core of the dataset revolves around responses to hypothetical scenarios designed to assess susceptibility to the money illusion. These scenarios include decisions about signing contracts under inflation uncertainty, and buying or selling items after an inflation increase, reflecting real-life economic decisions that people might face.

Temporal and Response Details: Each record includes timestamps for the start and end of the survey, the type of response, progress through the survey, duration in seconds, and completion status.

Verification Questions: To ensure participants understood the scenarios accurately, verification questions were included. These serve as a quality control measure, filtering for data quality and comprehension.

2.2 Data Analysis Tools

The data analysis was performed using R (R Core Team 2022), a powerful open-source statistical programming language. Key packages from the tidyverse collection (Wickham et al. 2019) were employed to streamline data manipulation, visualization, and analysis processes. These packages include ggplot2 (Wickham 2016) for creating advanced graphics, dplyr (Wickham et al. 2022) for data manipulation, readr (Wickham, Hester, and Bryan 2022) for its robust data reading functionalities, here (Müller 2020) is used to avoid file path issue, and knitr (Xie 2014) for dynamic report generation.

2.3 Data Cleaning

Data cleaning is a critical step in ensuring the accuracy and reliability of the analysis. The detailed procedure and the R script used for data cleaning are available in `scripts/01_cleanup_data.R`. The script elucidates the steps taken to refine the dataset by filtering out incomplete records and unnecessary columns for this study. The steps are: 1. Remove the first row in the dataset, since it is used to store the description to the column name. 2. Remove unnecessary columns for this study, by only keep the gender and responses columns. 3. Remove all gender rows with 'na' since this study is focusing on the behavior for money illusion for male and female participants. The cleaned dataset is conveniently saved at `outputs/data/cleaned_money_data.csv`, ready for in-depth analysis.

2.4 Data Sample

Table 1: Sample of the Cleaned Money Illusion Data for Question 1

ID	gênero	economicam	felicidade	atratividade_trab
1	Mulher	Carolina	NA	NA
2	Mulher	Carolina	NA	NA
3	Homem	NA	Maria	NA
4	Mulher	NA	Maria	NA
5	Mulher	NA	NA	Maria
6	Mulher	NA	NA	Maria

ID	gênero	economicam	felicidade	atratividade_trab

Table 2: Sample of the Cleaned Money Illusion Data for Question 2

ID	gênero	A casa_1	A casa_2	A casa_3
1	Mulher	3	2	1
2	Mulher	3	2	1
3	Homem	3	1	2
4	Mulher	3	2	1
5	Mulher	3	2	1
6	Mulher	3	2	1

Table 3: Sample of the Cleaned Money Illusion Data for Question 3

ID	gênero	poltrona_venda_reais	poltrona_compra_reai	poltrona_venda_porce
1	Mulher	NA	NA	Mais suscetível
2	Mulher	NA	NA	Mais suscetível
3	Homem	Igual	Menos suscetível	NA
4	Mulher	NA	NA	Menos suscetível
5	Mulher	Menos suscetível	Mais suscetível	NA
6	Mulher	NA	NA	Igual

Table 4: Sample of the Cleaned Money Illusion Data for Question 4

ID	gênero	contrato_AB	contrato_CD	contrato_EF
1	Mulher	NA	D	NA
2	Mulher	NA	NA	E
3	Homem	NA	NA	F
4	Mulher	B	NA	NA
5	Mulher	NA	C	NA
6	Mulher	B	NA	NA

2.5 Measurement

3 Results

3.1 Problem 1:

Hypothetical Analysis: Gender Perspectives on Economic Decisions: The graph suggests that men favored "Carolina" in economic terms and "Maria" in job attractiveness. This could hypothetically indicate that men associate the concept of "Carolina" with economic stability and "Maria" with professional opportunities. Analyzing this alongside gender could reveal whether women make similar associations or have a contrasting view.

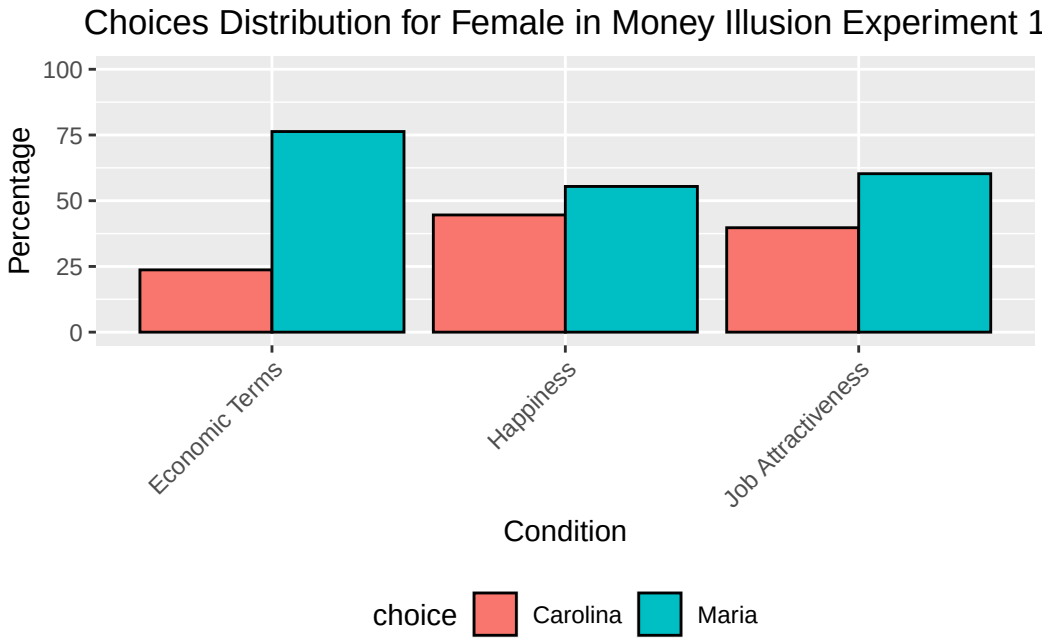

Figure 1: The percentage of female participants' choices within each condition in problem 1.

Observations from Figure 1 for female participants' choices:

Economic Terms: A significant majority of female participants chose "Carolina" over "Maria" in economic terms. This choice distribution is similar to that of the male participants, suggesting a consensus across genders regarding economic choices tied to "Carolina".

Happiness: Female participants seem evenly split between "Carolina" and "Maria" when it comes to happiness, which differs from male participants, who showed a slight preference for "Maria" in this condition. This could suggest that women see both "Carolina" and "Maria" as equally viable options for emotional fulfillment or that happiness is not as strongly associated with either choice as it is with economic terms.

Job Attractiveness: The choices for job attractiveness among female participants are also evenly distributed between "Carolina" and "Maria", whereas male participants had a prefer-

ence for "Maria". This could imply that for women, the qualities or opportunities represented by "Carolina" and "Maria" are equally attractive in a professional setting.

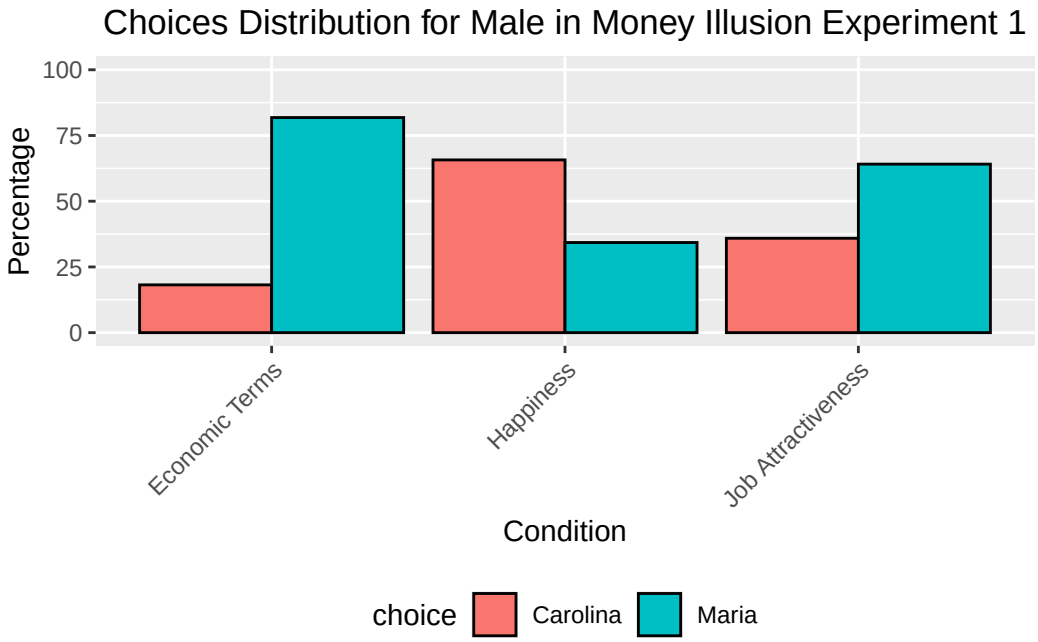

Figure 2: The percentage of male participants' choices within each condition in problem 1.

Observations from Figure 2 for male participants' choices:

Economic Terms: A significant majority of male participants chose "Carolina" over "Maria" in economic terms. This indicates a strong preference for the economic implications associated with "Carolina" among male participants, suggesting they may perceive "Carolina" as a more stable or profitable economic choice.

Happiness: The male participants' choices for happiness are nearly evenly split, with a slight preference for "Carolina." This distribution shows that men do not strongly associate either "Carolina" or "Maria" with happiness or that they see both options as similarly capable of providing emotional satisfaction.

Job Attractiveness: Male participants displayed a clear preference for "Maria" in terms of job attractiveness. This could suggest that the attributes or opportunities associated with "Maria" resonate more with men when considering the attractiveness of a job or career path.

Gender Comparison Analysis: Economic Rationality: Both genders show a strong preference for "Carolina" in economic terms, which might suggest that "Carolina" represents a more financially beneficial or stable option. This similarity indicates that both men and women may prioritize financial stability in their decision-making processes.

Emotional Considerations: The contrast in happiness choices between genders is subtle but present. Men's slight preference for "Maria" might suggest that they associate "Maria" with emotional well-being slightly more than women do. However, women's even split could indicate a balanced view or a lesser degree of differentiation between "Carolina" and "Maria" in terms of happiness.

Professional Preferences: The difference in job attractiveness choices is more pronounced, with men preferring "Maria" and women showing no clear preference. This may suggest that men and women have different criteria for what makes a job attractive or that they value different aspects of a job.

Hypothetical Narrative: Given these observations, we might theorize that both men and women in this experiment view "Carolina" as the more economically sound choice. This could reflect a societal consensus on certain financial principles or values.

In terms of happiness and job attractiveness, women's even split between "Carolina" and "Maria" contrasts with men's preferences, potentially indicating that women have a more holistic approach, valuing multiple aspects equally when it comes to job satisfaction and emotional well-being.

Conclusion: The data from both genders in the Money Illusion Experiment 1 seems to suggest that while there may be common ground in economic decisions, there are nuanced differences in how happiness and job attractiveness are perceived. These differences could be due to various factors, including societal roles, individual experiences, or inherent biases in the experiment design.

It's important to note that these interpretations are speculative and based on limited information. In reality, a thorough analysis would require more context about the experiment, including how "Carolina" and "Maria" were presented to the participants and what they represent, as well as a deeper statistical analysis to validate any conclusions drawn. Additionally, a more nuanced understanding of "rationality" and "emotion" in economic decisions would be necessary to make more definitive claims about gender differences in financial perspectives.

3.2 Problem 2:

Hypothetical Analysis:

Gender Perspectives on Seller Choices: The graphs for Money Illusion Experiment 2 show distinct patterns in how male and female participants rank sellers—Andre, Bento, and Marcelo. Hypothetically, this could indicate that male participants associate Andre with immediate value or appeal, as evidenced by his high ranking as the first choice, while Bento and Marcelo may represent longer-term benefits or stability, which becomes more apparent in the subsequent choices. On the other hand, female participants show a strong initial preference for Marcelo, suggesting they may perceive Marcelo as a symbol of immediate trustworthiness or value. Bento's consistent middle-ground ranking among females could indicate a perception of balanced or average appeal.

The preference dynamics could be interpreted as men being more likely to revise their initial judgments, while women might be consistent in their preferences. Analyzing these choices alongside gender could reveal whether men and women apply different criteria when evaluating the options presented to them, possibly due to differing risk assessments, values, or expectations in economic decisions. The shift in preferences for both genders as they move from first to third choice could suggest a complex decision-making process where initial impressions are adjusted upon further reflection or comparison.

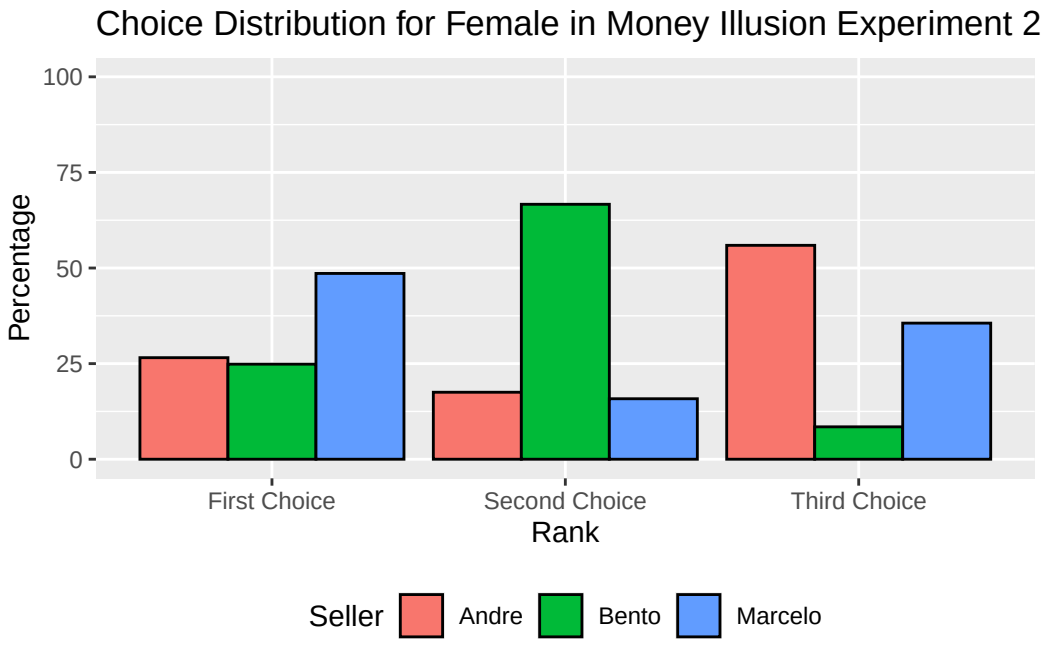

Figure 3: The percentage of female participants' choices ranking each seller in problem 2

Observations from Figure 3 for female participants' choices: First Choice:

Andre appears to be the least favored as the first choice among female participants. Bento has a moderate preference as the first choice. Marcelo is the most preferred seller for the first choice. Second Choice:

Andre sees a significant increase in preference from the first to the second choice. Bento is the most selected as the second choice. Marcelo's preference drops, making him the least favored for the second choice. Third Choice:

Andre is again the least preferred as the third choice. Bento's preference decreases compared to the second choice. Marcelo's preference increases, making him the most favored for the third choice.

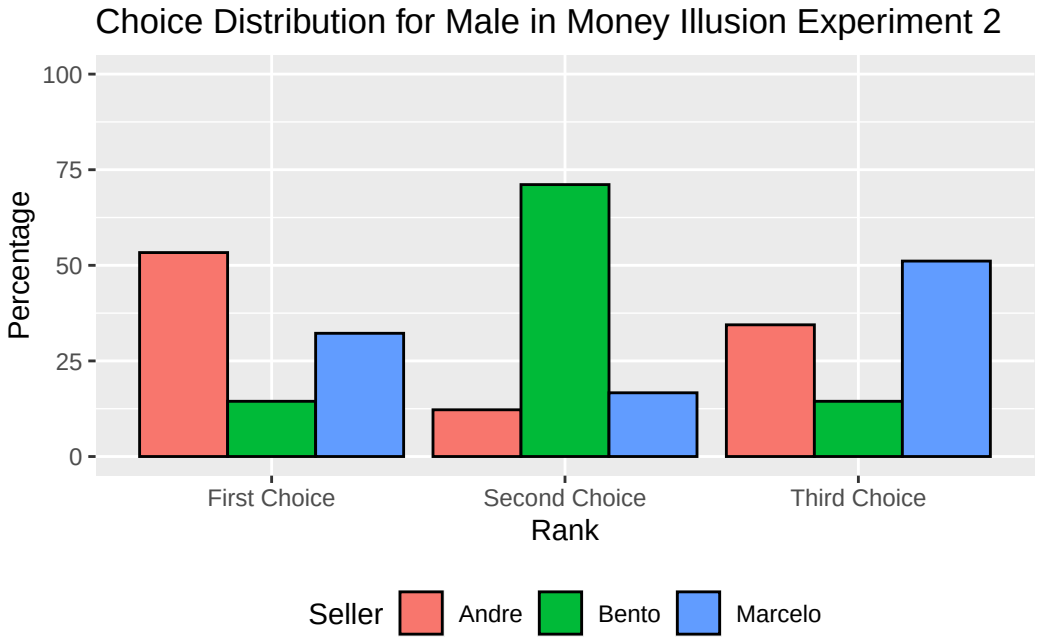

Figure 4: The percentage of male participants' choices ranking each seller in problem 2

Observations from Figure 4 Male Participants' Choices:

First Choice: Andre has the highest preference as the first choice among male participants. Bento is the least preferred as the first choice. Marcelo has a moderate preference as the first choice.

Second Choice: Andre's preference decreases significantly from the first to the second choice. Bento is the most preferred as the second choice, showing a substantial increase from the first choice. Marcelo's preference remains relatively stable across the first and second choices.

Third Choice: Andre has a moderate increase in preference as the third choice. Bento's preference drops slightly from the second choice. Marcelo sees a significant increase and is the most favored as the third choice.

Gender Comparison Analysis: First Choice Dynamics:

Male participants show a clear preference for Andre as their first choice, while female participants favor Marcelo. This difference could reflect varying criteria or perceptions of value between genders. Bento is the least favored first choice by males but holds a moderate preference among females, suggesting different initial impressions based on gender. Evolution of Preferences:

Both genders show a shifting pattern in their preferences from the first to the third choice, indicating a reevaluation of the sellers as they move down the rank order.

Andre's stark contrast between the first and subsequent choices in male participants could suggest a reconsideration of initial impressions after comparing all options. Consensus on Final Choices:

Marcelo emerges as the most favored third choice for both genders, suggesting a commonality in the eventual perception of value or appeal.

Hypothetical Narrative:

The divergent first choices between genders could imply that male and female participants have different priorities or strategies in initial decision-making. As the ranking progresses, both genders adjust their preferences, which could suggest a nuanced evaluation process where certain qualities or offers become more or less important as comparison occurs. This pattern of preference change might reflect a complex decision-making process influenced by a variety of factors, including risk assessment, perceived value, or even seller presentation.

Conclusion:

While male and female participants show different initial preferences, there is a convergence in choices by the third rank, with Marcelo being the favored seller for both. This could indicate that while initial assessments may vary between genders, there is potential for a shared consensus to emerge as more information is considered. It is important to recognize that these interpretations are based on limited data from the bar graphs provided and the actual reasons behind these choices could be multifaceted and would benefit from further qualitative insights.

3.3 Problem 3

Hypothetical Analysis:

Gender Perspectives on Financial Decisions: The graphs for Money Illusion Experiment 3 display the decision-making tendencies of male and female participants when faced with the option to buy or sell under varying conditions of likelihood ('More', 'Same', 'Less'). Analyzing this alongside gender can reveal nuanced approaches to market engagement. This hypothetical analysis could be pointing to underlying gender differences in economic decision-making, where men might prioritize growth or investment maintenance, and women might prioritize financial security and opportunistic gains. However, it's crucial to approach these assumptions critically, as individual decisions are influenced by a range of personal, social, and economic factors beyond gender.

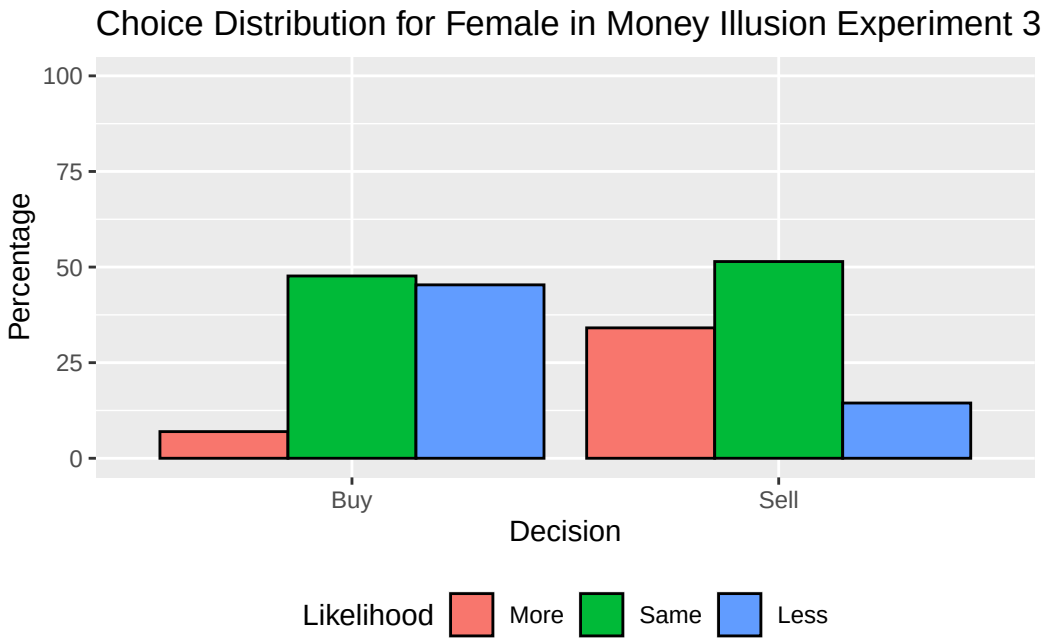

Figure 5: The percentage of female participants' choices (more, same, less) for both 'buy' and 'sell' conditions in problem 3

Observations from Figure 5 for female participants' choices:

Buy Decisions: Females show the least likelihood to buy more and a similar inclination to buy less or the same. This could indicate a cautious or conservative approach to purchasing decisions, possibly prioritizing stability or risk aversion.

Sell Decisions: The tendency to sell more is considerably higher than to sell less, with selling the same as an intermediate option. This pattern might suggest a greater openness to divesting

or capitalizing on assets when conditions are favorable, or it could reflect a strategic approach to managing investments.

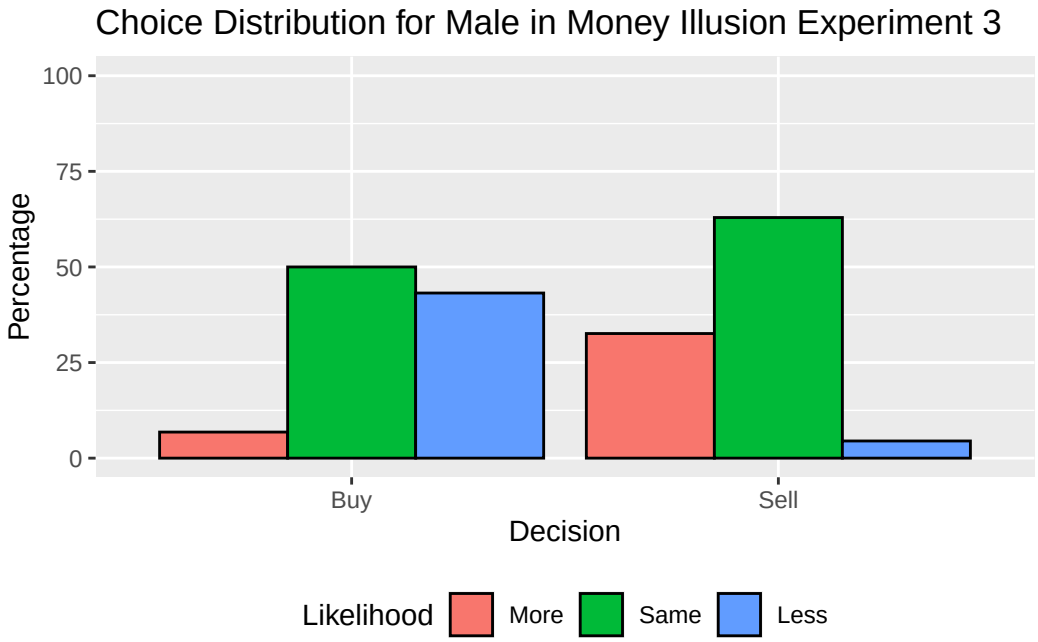

Figure 6: The percentage of male participants' choices (more, same, less) for both 'buy' and 'sell' conditions in problem 3

Observations from Figure 6 for male participants' choices:

Buy Decisions: Males show a balanced approach between buying more and the same, with less likelihood to buy less. This distribution could imply a more assertive or optimistic strategy toward acquiring assets or a greater confidence in market conditions.

Sell Decisions: There is a strong preference for selling the same, followed by selling more, and the least for selling less. This could suggest a preference for maintaining the status quo or a calculated approach to selling, where changes in market conditions are considered but not reacted to hastily.

Gender Comparison

Buying Behavior: Females appear more conservative, potentially weighing the risks more heavily, while males seem to demonstrate a readiness to invest, indicating a possible difference in risk tolerance. Selling Behavior: Females are more likely to sell more, which might suggest a strategy to capitalize on gains or avoid losses. In contrast, males' preference for selling the same amount could indicate a long-term investment strategy or a less reactive approach to market fluctuations.

Conclusion:

The observed differences in the buying and selling behaviors of male and female participants in Money Illusion Experiment 3 may reflect underlying gender-specific financial strategies or risk preferences. While females may exhibit cautious purchasing behavior and a proactive selling stance, males seem to lean toward balanced buying and less reactive selling. These insights, while hypothetical, could inform further investigation into gender-based economic decision-making patterns. It's important to acknowledge that these interpretations are speculative and that actual decision-making processes are complex and influenced by a myriad of factors beyond gender.

3.4 Problem 4

Hypothetical Analysis: Gender Perspectives on Financial Risk Decisions: The graphs for Money Illusion Experiment 4 reveal the choices of male and female participants regarding different contract types characterized as riskless and risky across real, nominal, and neutral terms.

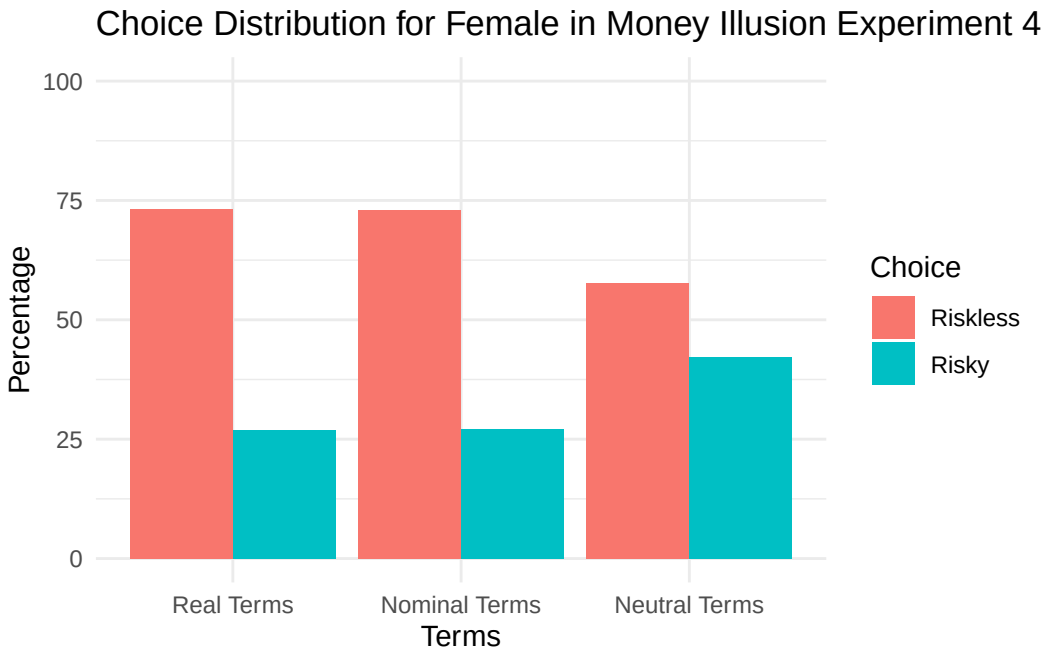

Figure 7: The percentage of female participants' choices of contract types across frames(real, nominal and neutral) in problem 4

Observations from **?@fig-question4-female** for female participants' choices:

Real Terms: Females show a preference for riskless contracts, potentially indicating a perception of real terms as more tangible and, thus, preferring security in transactions that are adjusted for inflation or reflect actual purchasing power.

Nominal Terms: A slight preference for riskless contracts over risky ones in nominal terms could suggest a cautious approach towards transactions that are not adjusted for inflation, reflecting a concern for potential value loss over time.

Neutral Terms: The distribution is more balanced, but still, riskless contracts are slightly preferred, which might indicate a general tendency towards caution regardless of the framing of terms.

Observations from **?@fig-question4-male** for male participants' choices:

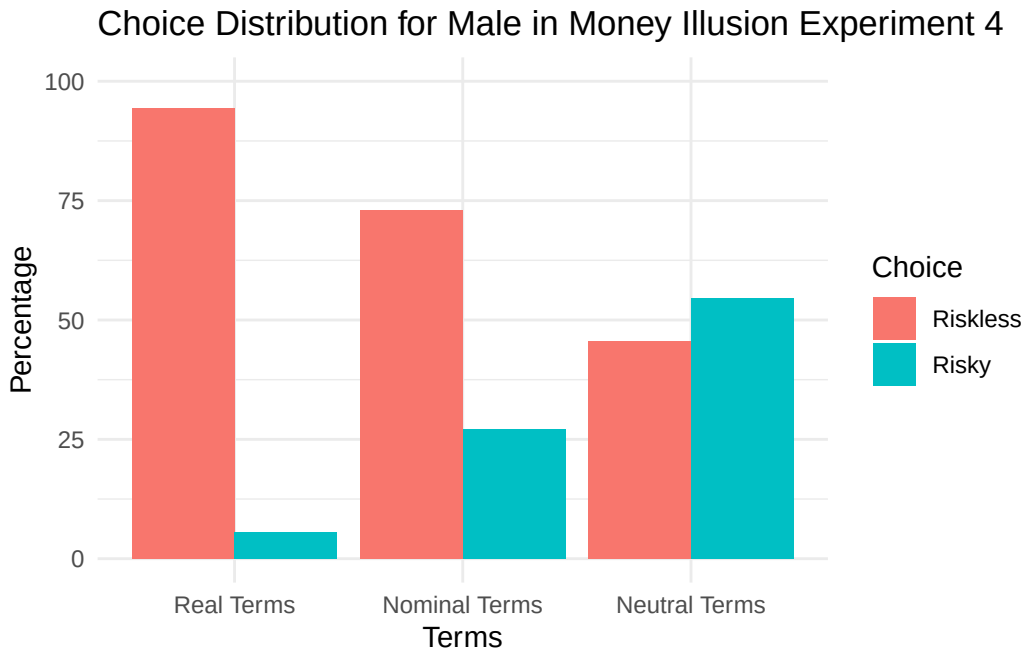

Figure 8: The percentage of male participants' choices of contract types across frames(real, nominal and neutral) in problem 4

Real Terms: Males show an overwhelming preference for riskless contracts in real terms, possibly valuing the certainty of returns that account for inflation and maintain purchasing power.

Nominal Terms: The preference shifts towards risky contracts, implying that men might be more willing to engage in speculative transactions when dealing with nominal values that do not account for inflation.

Neutral Terms: There is a nearly even split, with a slight lean towards riskless contracts, suggesting that without specific framing, men might default to a more balanced risk approach.

Gender Comparison:

Risk Preferences in Real Terms: Both genders exhibit a strong preference for riskless contracts, possibly due to the direct impact of inflation-adjusted transactions on real-world purchasing power.

Risk Preferences in Nominal Terms: A stark difference is observed; women remain cautious, whereas men become risk-takers, which could imply a gender-based divergence in responses to economic scenarios where inflation or value erosion is a factor.

Risk Preferences in Neutral Terms: The slight preference for riskless contracts among both genders indicates a baseline aversion to risk when the terms are not clearly defined or when the framing is neutral.

Conclusion:

The data from Money Illusion Experiment 4 suggests that both men and women tend to prefer riskless contracts, especially in real terms, indicating a common desire for security in financially tangible scenarios. However, when the framing shifts to nominal terms, gender differences emerge, with men displaying a higher tolerance for risk. These hypothetical observations could reflect underlying gender differences in financial risk perception and economic decision-making. However, it is critical to consider these insights within the broader context of individual financial behavior, which is influenced by various personal, cultural, and situational factors beyond gender.

4 Conclusion

5 Apenndix

5.1 Rough Sketch about Brainstorming

For a visual depiction of the brainstorming process and the initial ideas that shaped this study, please refer to the document located at `inputs/misc/Plan-Sketch.pdf`. This sketch includes preliminary thoughts on the data structure and one potential approach to address the research questions.

5.2 Data Simulation

The simulated dataset, designed to mirror the structure of the actual "Money Illusion" dataset, can be found at `scripts/00-simulate-data_data.R`. This script meticulously generates a dataset of 100 hypothetical delay instances.

5.3 Download Data from Open Science Framework

Interested researchers can access the original dataset from the Brazilian researchers for further analysis or replication studies at the following URL: https://osf.io/48pqu/

5.4 Data Cleaning Process

Data cleaning is a critical step in ensuring the accuracy and reliability of the analysis. The detailed procedure and the R script used for data cleaning are available in `scripts/01_cleanup_data.R`. The script elucidates the steps taken to refine the dataset by filtering out incomplete records and unnecessary columns for this study. The steps are: 1. Remove the first row in the dataset, since it is used to store the description to the column name. 2. Remove unnecessary columns for this study, by only keep the gender and responses columns. 3. Remove all gender rows with 'na' since this study is focusing on the behavior for money illusion for male and female participants. The cleaned dataset is conveniently saved at `outputs/data/cleaned_money_data.csv`, ready for in-depth analysis.

5.5 Data Set Validity Testing

To affirm the integrity and consistency of the cleaned dataset, a series of validation tests are performed using the script `scripts/03-test-data-validity.R`. This script performs three crucial checks to ensure the data set's accuracy and consistency:

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