

ONLINE APPENDIX FOR “Experiments on Portfolio Selection: A comparison between quantile preferences and expected utility decision models”

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This appendix collects additional results. Section 1 presents the instructions of the experiment. Section 2 provides detailed summary statistics of the experiments. Finally, Section 3 describes the payoffs of all the portfolio combinations under the quantile preferences (QP) and the mean-variance (MV) models.

1 Instructions for the experiment

Testing your knowledge of the uniform distribution:

Thank you for joining this experiment! Before going to today’s main experiment, we want to familiarize you with the concept of the uniform distribution, which will be helpful for making good decisions during this experiment. To start, please carefully read the following explanation of the uniform distribution. Then on the next page, we will test your knowledge of the concept, and the results of the test will help your payoff from today’s experiment. So make sure to do your best to understand the concept.

The uniform distribution describes the probability that an event will occur, where uniform means each event is equally likely. It can be easily understood using rectangles. The orange rectangle below describes the uniform distribution between 0 and 1. Note that the area of the rectangle will always equal 1.

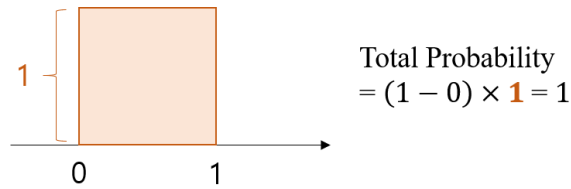
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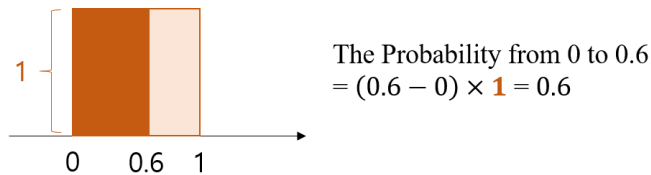
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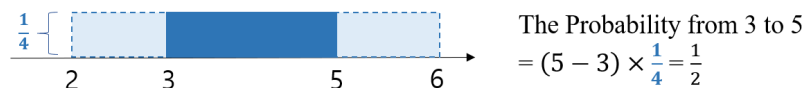
Let's imagine a number between 0 and 1 is randomly picked from this distribution. What is the probability that the number picked is between 0 and 0.6? To answer this, we can simply find the area of the rectangle starting at 0 and ending at 0.6, as follows:



So the probability that the number picked is between 0 and 0.6 is 0.6. In other words, there is a 60% chance that the number picked is between 0 and 0.6. Let's see another example. The blue rectangle below describes the uniform distribution between 2 and 6. The height of the rectangle is $\frac{1}{4}$ because the area of the rectangle will always equal 1.



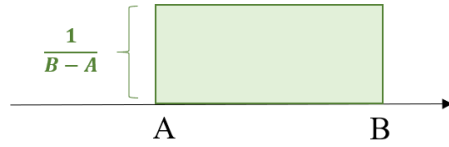
Let's imagine a number between 2 and 6 is randomly picked from this distribution. What is the probability that the number is between 3 and 5? To answer this, we can simply find the area of the rectangle starting at 3 and ending at 5, as follows:



So the probability that the number picked is between 3 and 5 is $\frac{1}{2}$. In other words, there is a 50% chance that the number picked is between 3 and 5.

Notice that for wider rectangles there are more numbers that could be picked at random. But wide rectangles are short in height, meaning each number is less likely to be picked. Put simply, the rectangle represents the probability of picking a number at random, where the height represents how often the number is picked, and the width represents the range of possible numbers that could be picked.

The green rectangles below summarize the concept of the uniform distribution between any two numbers A and B:



$$\begin{aligned} \text{Total Probability} \\ &= (B - A) \times \frac{1}{B - A} = 1 \end{aligned}$$

The rectangle starts at A and ends at B, so its width is $B - A$. To ensure that the area of the rectangle equals 1, the height of the rectangle is $\frac{1}{B - A}$. To find the probability that a randomly picked number is between C and D, we find the area of the rectangle that starts at C and ends at D:

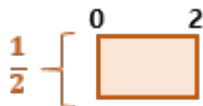


$$\begin{aligned} \text{The Probability from C to D} \\ &= (D - C) \times \frac{1}{B - A} = \frac{D - C}{B - A} \end{aligned}$$

You don't have to memorize these formulas. It is good enough to understand the meaning of the width and height of the rectangles. If you still do not understand the concept of the uniform distribution, please carefully re-read this page. Your payoff from this experiment will be influenced by how well you understand the concept. If you feel you do understand the concept of the uniform distribution, then we will test your knowledge of the concept with a short quiz. Please click the next button to proceed.

Here are three quizzes. If you solve all quizzes correctly, then you can get 2 dollars as a bonus. If you solve two quizzes correctly, then you can get 1 dollar as a bonus. Otherwise, you cannot get any bonus. Please solve the quizzes below.

Quiz1) There is a uniform distribution in $[0, 2]$.



If you consider the probability that a number is drawn from 0 to 1, the probability is:

- 0
- 3/10
- 1/2
- 1

Quiz2) There is a uniform distribution in $[0, 10]$.



If you consider the probability that a number is drawn from 0 to 3, the probability is:

- 1
- 2/5
- 3/10
- 1/2

Quiz3) There is a uniform distribution in [1, 5].



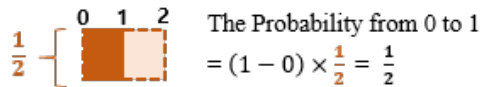
If you consider the probability that a number is drawn from 2 to 4, the probability is:

- 1/3
- 1/2
- 2/3
- 1

(After finishing subjects' answers) Here is your bonus. You answered [the number of right answers] out of 3 quizzes correctly. Thus, your bonus by quiz is [2 if 3 right answers, 1 if 2 right answers, 0, otherwise] dollars.

Through three quizzes, you can learn how to understand uniform distribution. The keys for quizzes are as follows:

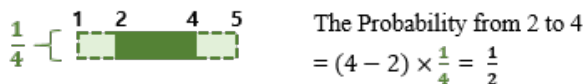
Quiz1) The uniform distribution is $U[0, 2]$ and the probability from 0 to 1 is:



Quiz2) The uniform distribution is $U[0, 10]$ and the probability from 0 to 3 is:



Quiz3) The uniform distribution is $U[1, 5]$ and the probability from 2 to 4 is:



Click "Next" to read instruction for today's main experiment!

Instructions:

You are about to participate in an experiment in the economics of decision-making. The instructions are simple and if you follow them carefully and make good decisions, you will earn some money that will be paid to you in cash at the end of the experiment. The experiment consists of six sessions and each session has 15 questions. You will get your earnings from one randomly selected answer during this experiment, including a show-up fee and your bonus by the quiz. The question that counts toward your earnings will be determined randomly at the end of the experiment by the computer.

You will be shown a total of 90 separate questions over the course of six sessions about how to divide a set of tokens between two payoff options, called Option A and Option B. For each question, you will make a decision to assign your tokens as a portfolio. Easily, you can think of tokens as percentages.

You will have 100 tokens for each question. The tokens indicate the weights out of 100 that you will allocate to each Option. You can assign between 0 to 100 tokens to each of the options and you should assign all 100 of your tokens so that you have none left over after each question. Each Option can be given to you as an interval or a constant number. Each option can lead to different payments.

Below is an example of what the question screen will look like:

Allocate **100 tokens** into the two blanks. The sum of two blanks should be 100.

| | | |
|------------------------------------------------------|--|--------------------------------|
| <p>[Option A]</p> <p>$\frac{1}{2}$</p> | | <input type="text" value="0"/> |
| <p>[Option B]</p> <p>$\frac{1}{20}$</p> | | <input type="text" value="0"/> |
| <p>Total</p> | | <input type="text" value="0"/> |

As you can see, there are two options, Option A and Option B, represented by two rectangles. The width of the rectangle shows the maximum amount of money you could win by choosing that option. The height of the rectangle represents how likely you are to win each amount.

In the screen shown above, Option A varies from \$0 to \$2. Option B varies from \$0 to \$20. The computer will randomly select a number between \$0 and \$2 with equal probability for Option A and randomly select a number between \$0 and \$20 with equal probability for Option B.

Look at the table below. Each column indicates the number of tokens that you allocate to each Option (A or B). In the first column, we suppose that you have allocated 40 tokens to Option A and 60 tokens to Option B. In the second column, we assume that you have allocated 0 tokens to Option A and 100 tokens to Option B. Each line allows for considering different realizations of the lotteries in Options A and B.

For example, the first line shows the case in which \$0.5 is randomly selected from Option A and \$8 is randomly selected from Option B. The second line shows the case in which \$0.3 is randomly selected from Option A and \$8 is randomly selected from Option B. The cells of the table indicate the results of earnings for each case. As there are many cases for Option A which varies from \$0 to \$2 and for Option B which varies from \$0 to \$20, you can allocate your 100 tokens to each Option A or B.

| The Realized cases of the lotteries $A \sim U[0,2]$ and $B \sim U[0,20]$ | | If you allocate 40 Tokens to A and 60 Tokens to B | If you allocate 0 Tokens to A and 100 Tokens to B |
|-----------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------|------------------------------------------------------|
| Case1) | Option A obtains \$0.5 Option B obtains \$8 | $40\% \times \$0.5 + 60\% \times \$8 = \$5$ | $0\% \times \$0.5 + 100\% \times \$8 = \$8$ |
| Case2) | Option A obtains \$0.3 Option B obtains \$8 | $40\% \times \$0.3 + 60\% \times \$8 = \$4.92$ | $0\% \times \$0.3 + 100\% \times \$8 = \$8$ |

You will see six screens. Each screen will show 15 questions like this, where you will see various and be asked to allocate your 100 tokens. Once you have completed the 15 questions on the screen, click the "Next" button on the bottom right of your screen. You will then see another set of 15 questions to complete. Once you complete the sixth set, click the "Next" button. Then, you can see your total earnings, including your show-up fee.

The computer will randomly select one of the payoffs from the 90 questions. For example, if the computer randomly selected the payoff from the Case1 that you allocate 40 tokens to Option A and 60 tokens to Option B, then your total payment for participating today would be \$00, which is the \$5 (earnings from allocating your tokens), plus the other \$5 (show-up fee), plus the bonus that you earned by the quiz.

Please remember your total earnings on the final page to record it to the payment form, and then click the "Next" button one more. Then, your experiment for today will be done.

Click "Next" to start the game!

2 Summary statistics across tasks

Table 3: Summary statistics on selected portfolio weights by task

| Task | Mean | Std.dev. | 10th perc | 25th perc | Median | 75th perc | 90th perc | Mode | Min | Max |
|------|-------|----------|-----------|-----------|--------|-----------|-----------|-------|-------|-------|
| 1 | 0.196 | 0.286 | 0.000 | 0.000 | 0.100 | 0.300 | 0.500 | 0.000 | 0.000 | 1.000 |
| 2 | 0.276 | 0.308 | 0.000 | 0.000 | 0.180 | 0.500 | 0.750 | 0.000 | 0.000 | 1.000 |
| 3 | 0.293 | 0.270 | 0.000 | 0.000 | 0.250 | 0.500 | 0.700 | 0.000 | 0.000 | 1.000 |
| 4 | 0.312 | 0.277 | 0.000 | 0.050 | 0.250 | 0.500 | 0.800 | 0.000 | 0.000 | 1.000 |
| 5 | 0.330 | 0.289 | 0.000 | 0.000 | 0.300 | 0.500 | 0.750 | 0.000 | 0.000 | 1.000 |
| 6 | 0.410 | 0.286 | 0.000 | 0.200 | 0.400 | 0.550 | 0.800 | 0.500 | 0.000 | 1.000 |
| 7 | 0.378 | 0.268 | 0.000 | 0.100 | 0.400 | 0.550 | 0.690 | 0.000 | 0.000 | 1.000 |
| 8 | 0.364 | 0.271 | 0.000 | 0.100 | 0.400 | 0.500 | 0.700 | 0.000 | 0.000 | 1.000 |
| 9 | 0.406 | 0.265 | 0.000 | 0.100 | 0.500 | 0.500 | 0.700 | 0.500 | 0.000 | 1.000 |
| 10 | 0.537 | 0.138 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.230 | 1.000 |
| 11 | 0.322 | 0.300 | 0.000 | 0.000 | 0.250 | 0.600 | 0.750 | 0.000 | 0.000 | 1.000 |
| 12 | 0.361 | 0.304 | 0.000 | 0.000 | 0.400 | 0.600 | 0.750 | 0.000 | 0.000 | 1.000 |
| 13 | 0.344 | 0.309 | 0.000 | 0.000 | 0.300 | 0.600 | 0.800 | 0.000 | 0.000 | 1.000 |
| 14 | 0.336 | 0.285 | 0.000 | 0.000 | 0.350 | 0.500 | 0.700 | 0.000 | 0.000 | 1.000 |
| 15 | 0.372 | 0.293 | 0.000 | 0.100 | 0.400 | 0.550 | 0.750 | 0.000 | 0.000 | 1.000 |
| 16 | 0.418 | 0.342 | 0.000 | 0.000 | 0.400 | 0.700 | 0.900 | 0.000 | 0.000 | 1.000 |
| 17 | 0.372 | 0.306 | 0.000 | 0.000 | 0.400 | 0.600 | 0.750 | 0.000 | 0.000 | 1.000 |
| 18 | 0.384 | 0.318 | 0.000 | 0.000 | 0.400 | 0.650 | 0.800 | 0.000 | 0.000 | 1.000 |
| 19 | 0.366 | 0.279 | 0.000 | 0.100 | 0.400 | 0.600 | 0.700 | 0.000 | 0.000 | 1.000 |
| 20 | 0.444 | 0.275 | 0.000 | 0.400 | 0.500 | 0.550 | 0.750 | 0.500 | 0.000 | 1.000 |
| 21 | 0.712 | 0.249 | 0.500 | 0.500 | 0.700 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 22 | 0.758 | 0.246 | 0.500 | 0.600 | 0.800 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 23 | 0.792 | 0.242 | 0.410 | 0.700 | 0.800 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 24 | 0.800 | 0.250 | 0.400 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 25 | 0.845 | 0.243 | 0.500 | 0.800 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 26 | 0.748 | 0.265 | 0.500 | 0.600 | 0.750 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 27 | 0.810 | 0.245 | 0.500 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 28 | 0.818 | 0.244 | 0.500 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 29 | 0.846 | 0.248 | 0.500 | 0.800 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 30 | 0.875 | 0.230 | 0.500 | 0.870 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 31 | 0.767 | 0.245 | 0.500 | 0.600 | 0.800 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 32 | 0.807 | 0.211 | 0.600 | 0.600 | 0.900 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 33 | 0.825 | 0.236 | 0.500 | 0.750 | 0.950 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 34 | 0.868 | 0.240 | 0.500 | 0.800 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 35 | 0.844 | 0.246 | 0.500 | 0.800 | 0.990 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 36 | 0.739 | 0.232 | 0.500 | 0.500 | 0.750 | 1.000 | 1.000 | 1.000 | 0.200 | 1.000 |
| 37 | 0.771 | 0.235 | 0.500 | 0.600 | 0.800 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 38 | 0.820 | 0.204 | 0.500 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 39 | 0.827 | 0.195 | 0.500 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 0.500 | 1.000 |
| 40 | 0.816 | 0.222 | 0.500 | 0.600 | 0.950 | 1.000 | 1.000 | 1.000 | 0.200 | 1.000 |
| 41 | 0.837 | 0.209 | 0.500 | 0.700 | 0.950 | 1.000 | 1.000 | 1.000 | 0.200 | 1.000 |

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Table 3 – *Continued from previous page*

| Task | Mean | Std.dev. | 10th perc | 25th perc | Median | 75th perc | 90th perc | Mode | Min | Max |
|------|-------|----------|-----------|-----------|--------|-----------|-----------|-------|-------|-------|
| 42 | 0.849 | 0.206 | 0.500 | 0.700 | 1.000 | 1.000 | 1.000 | 1.000 | 0.250 | 1.000 |
| 43 | 0.845 | 0.217 | 0.500 | 0.750 | 1.000 | 1.000 | 1.000 | 1.000 | 0.100 | 1.000 |
| 44 | 0.862 | 0.218 | 0.500 | 0.800 | 1.000 | 1.000 | 1.000 | 1.000 | 0.100 | 1.000 |
| 45 | 0.830 | 0.191 | 0.500 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 0.500 | 1.000 |
| 46 | 0.763 | 0.241 | 0.500 | 0.500 | 0.800 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 47 | 0.878 | 0.187 | 0.500 | 0.800 | 1.000 | 1.000 | 1.000 | 1.000 | 0.160 | 1.000 |
| 48 | 0.865 | 0.179 | 0.500 | 0.750 | 1.000 | 1.000 | 1.000 | 1.000 | 0.500 | 1.000 |
| 49 | 0.834 | 0.214 | 0.500 | 0.700 | 0.950 | 1.000 | 1.000 | 1.000 | 0.100 | 1.000 |
| 50 | 0.830 | 0.187 | 0.500 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 0.500 | 1.000 |
| 51 | 0.787 | 0.215 | 0.500 | 0.600 | 0.800 | 1.000 | 1.000 | 1.000 | 0.160 | 1.000 |
| 52 | 0.822 | 0.197 | 0.500 | 0.600 | 0.900 | 1.000 | 1.000 | 1.000 | 0.500 | 1.000 |
| 53 | 0.765 | 0.225 | 0.500 | 0.550 | 0.800 | 1.000 | 1.000 | 1.000 | 0.100 | 1.000 |
| 54 | 0.785 | 0.211 | 0.500 | 0.550 | 0.800 | 1.000 | 1.000 | 1.000 | 0.420 | 1.000 |
| 55 | 0.797 | 0.225 | 0.500 | 0.600 | 0.850 | 1.000 | 1.000 | 1.000 | 0.100 | 1.000 |
| 56 | 0.595 | 0.283 | 0.200 | 0.500 | 0.600 | 0.800 | 1.000 | 0.500 | 0.000 | 1.000 |
| 57 | 0.645 | 0.258 | 0.280 | 0.500 | 0.700 | 0.800 | 1.000 | 0.700 | 0.000 | 1.000 |
| 58 | 0.607 | 0.263 | 0.286 | 0.500 | 0.600 | 0.750 | 1.000 | 0.500 | 0.000 | 1.000 |
| 59 | 0.645 | 0.275 | 0.300 | 0.500 | 0.700 | 0.800 | 1.000 | 0.500 | 0.000 | 1.000 |
| 60 | 0.644 | 0.252 | 0.400 | 0.500 | 0.650 | 0.800 | 1.000 | 0.500 | 0.000 | 1.000 |
| 61 | 0.702 | 0.285 | 0.300 | 0.500 | 0.750 | 0.910 | 1.000 | 1.000 | 0.000 | 1.000 |
| 62 | 0.586 | 0.276 | 0.100 | 0.400 | 0.600 | 0.760 | 0.950 | 0.700 | 0.000 | 1.000 |
| 63 | 0.651 | 0.243 | 0.400 | 0.500 | 0.600 | 0.800 | 1.000 | NA | 0.000 | 1.000 |
| 64 | 0.658 | 0.271 | 0.300 | 0.500 | 0.700 | 0.800 | 1.000 | 1.000 | 0.000 | 1.000 |
| 65 | 0.771 | 0.246 | 0.500 | 0.600 | 0.800 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 66 | 0.804 | 0.277 | 0.500 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 67 | 0.643 | 0.321 | 0.200 | 0.400 | 0.750 | 0.900 | 1.000 | 1.000 | 0.000 | 1.000 |
| 68 | 0.633 | 0.273 | 0.400 | 0.500 | 0.600 | 0.800 | 1.000 | 0.500 | 0.000 | 1.000 |
| 69 | 0.709 | 0.292 | 0.300 | 0.500 | 0.800 | 0.950 | 1.000 | 1.000 | 0.000 | 1.000 |
| 70 | 0.219 | 0.317 | 0.000 | 0.000 | 0.100 | 0.250 | 0.900 | 0.000 | 0.000 | 1.000 |
| 71 | 0.363 | 0.362 | 0.000 | 0.000 | 0.200 | 0.700 | 1.000 | 0.000 | 0.000 | 1.000 |
| 72 | 0.421 | 0.344 | 0.000 | 0.100 | 0.400 | 0.700 | 1.000 | 0.000 | 0.000 | 1.000 |
| 73 | 0.584 | 0.304 | 0.250 | 0.400 | 0.500 | 0.900 | 1.000 | NA | 0.000 | 1.000 |
| 74 | 0.692 | 0.298 | 0.250 | 0.500 | 0.800 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 75 | 0.802 | 0.248 | 0.400 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 76 | 0.868 | 0.211 | 0.630 | 0.800 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 77 | 0.890 | 0.224 | 0.800 | 0.810 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 78 | 0.931 | 0.180 | 0.800 | 0.950 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 79 | 0.969 | 0.123 | 0.990 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.250 | 1.000 |
| 80 | 0.792 | 0.268 | 0.500 | 0.600 | 0.900 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 81 | 0.768 | 0.338 | 0.090 | 0.500 | 0.950 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 82 | 0.494 | 0.342 | 0.000 | 0.200 | 0.400 | 0.840 | 1.000 | 1.000 | 0.000 | 1.000 |
| 83 | 0.784 | 0.291 | 0.500 | 0.500 | 0.950 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 84 | 0.681 | 0.301 | 0.200 | 0.500 | 0.750 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 85 | 0.758 | 0.269 | 0.500 | 0.500 | 0.800 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |

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Table 3 – *Continued from previous page*

| Task | Mean | Std.dev. | 10th perc | 25th perc | Median | 75th perc | 90th perc | Mode | Min | Max |
|------|-------|----------|-----------|-----------|--------|-----------|-----------|-------|-------|-------|
| 86 | 0.865 | 0.220 | 0.600 | 0.750 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 87 | 0.905 | 0.185 | 0.700 | 0.900 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 88 | 0.917 | 0.178 | 0.800 | 0.900 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 89 | 0.951 | 0.154 | 0.900 | 0.990 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 |
| 90 | 0.975 | 0.103 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.500 | 1.000 |

Table 4: Summary statistics on preference parameters comparison

| Task | \bar{d}_j | DM_j |
|------|-------------|--------|
| 1 | 0.099 | 2.027 |
| 2 | 0.113 | 2.723 |
| 3 | 0.099 | 4.052 |
| 4 | 0.211 | 3.204 |
| 5 | 0.268 | 2.914 |
| 6 | 0.254 | 1.325 |
| 7 | 0.380 | 0.935 |
| 8 | 0.493 | -0.673 |
| 9 | 0.648 | -1.699 |
| 10 | 0.042 | -0.716 |
| 11 | 0.169 | 2.637 |
| 12 | 0.225 | 3.915 |
| 13 | 0.352 | 1.825 |
| 14 | 0.465 | -0.844 |
| 15 | 0.493 | -1.518 |
| 16 | 0.211 | 3.799 |
| 17 | 0.310 | 0.605 |
| 18 | 0.338 | 1.196 |
| 19 | 0.493 | -0.360 |
| 20 | 0.592 | -1.411 |
| 21 | 0.592 | -1.090 |
| 22 | 0.479 | -1.633 |
| 23 | 0.535 | -3.221 |
| 24 | 0.563 | -3.014 |
| 25 | 0.338 | -0.272 |
| 26 | 0.592 | -1.864 |
| 27 | 0.423 | -1.855 |
| 28 | 0.465 | -3.654 |
| 29 | 0.465 | -3.039 |
| 30 | 0.366 | -1.645 |
| 31 | 0.521 | -1.463 |
| 32 | 0.493 | -4.367 |
| 33 | 0.479 | -3.845 |
| 34 | 0.338 | -1.243 |
| 35 | 0.465 | -2.329 |
| 36 | 0.577 | -2.149 |
| 37 | 0.352 | -0.836 |
| 38 | 0.254 | 1.964 |
| 39 | 0.099 | 5.176 |
| 40 | 0.028 | 5.334 |
| 41 | 0.014 | 5.117 |
| 42 | 0.014 | 4.624 |
| 43 | 0.014 | 4.554 |

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Table 4 – *Continued from previous page*

| Task | \bar{d}_j | DM _j |
|------|-------------|-----------------|
| 44 | 0.000 | 4.311 |
| 45 | 0.000 | 5.263 |
| 46 | 0.408 | 1.292 |
| 47 | 0.000 | 4.022 |
| 48 | 0.028 | 4.430 |
| 49 | 0.000 | 5.103 |
| 50 | 0.042 | 5.725 |
| 51 | 0.099 | 5.277 |
| 52 | 0.366 | 2.068 |
| 53 | 0.690 | -2.106 |
| 54 | 0.577 | -0.688 |
| 55 | 0.366 | -0.101 |
| 56 | 0.366 | -0.168 |
| 57 | 0.451 | -0.735 |
| 58 | 0.437 | -0.730 |
| 59 | 0.254 | 1.730 |
| 60 | 0.296 | 2.322 |
| 61 | 0.479 | -1.071 |
| 62 | 0.225 | 1.927 |
| 63 | 0.465 | 1.694 |
| 64 | 0.437 | 1.707 |
| 65 | 0.620 | -3.542 |
| 66 | 0.465 | -2.034 |
| 67 | 0.380 | 2.412 |
| 68 | 0.423 | -0.596 |
| 69 | 0.296 | 1.137 |
| 70 | 0.197 | 0.124 |
| 71 | 0.282 | -1.080 |
| 72 | 0.324 | 0.735 |
| 73 | 0.282 | 3.300 |
| 74 | 0.127 | 1.731 |
| 75 | 0.127 | 3.305 |
| 76 | 0.085 | 1.060 |
| 77 | 0.085 | -0.696 |
| 78 | 0.028 | -0.728 |
| 79 | 0.028 | 0.892 |
| 80 | 0.070 | 3.964 |
| 81 | 0.099 | 1.061 |
| 82 | 0.239 | 0.886 |
| 83 | 0.070 | 3.692 |
| 84 | 0.127 | 3.132 |
| 85 | 0.085 | 4.506 |
| 86 | 0.085 | 2.328 |
| 87 | 0.042 | 0.092 |

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Table 4 – *Continued from previous page*

| Task | \bar{d}_j | DM_j |
|------|-------------|--------|
| 88 | 0.028 | 0.017 |
| 89 | 0.028 | -0.821 |
| 90 | 0.014 | -0.750 |

3 Tasks for experiment

Here we show the optimal portfolio MV allocations and the optimal portfolio QP allocations from all of the tasks. These 90 tasks are divided in five categories in Sections 2.1 to 2.5. Each category considers a different type of relationship between two Uniform distributions, each corresponding to a different lottery A and B. The section also presents figures with the optimal portfolio allocation w^* , that corresponds to lottery A. Left panels plot the optimal allocation under the MV framework and the right panel plot the optimal allocation under the QP framework. The x-axis captures risk aversion. For the MV case, we report w^* as a function of $1/\gamma$, and for the QP case, we report w^* as a function of τ .

3.1 Experiments replicating Example 2.2:

In these examples, B first order stochastically dominates A. Note that the options in this experiment, described as lotteries, are reversed compared to the example.

- | | | |
|----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| [1] A : $\mathcal{U}[0, 2]$ B : $\mathcal{U}[0, 20]$ | [2] A : $\mathcal{U}[0, 4]$ B : $\mathcal{U}[0, 20]$ | [3] A : $\mathcal{U}[0, 6]$ B : $\mathcal{U}[0, 20]$ |
| [4] A : $\mathcal{U}[0, 8]$ B : $\mathcal{U}[0, 20]$ | [5] A : $\mathcal{U}[0, 10]$ B : $\mathcal{U}[0, 20]$ | [6] A : $\mathcal{U}[0, 12]$ B : $\mathcal{U}[0, 20]$ |
| [7] A : $\mathcal{U}[0, 14]$ B : $\mathcal{U}[0, 20]$ | [8] A : $\mathcal{U}[0, 16]$ B : $\mathcal{U}[0, 20]$ | [9] A : $\mathcal{U}[0, 18]$ B : $\mathcal{U}[0, 20]$ |
| [10] A : $\mathcal{U}[0, 20]$ B : $\mathcal{U}[0, 20]$ | [11] A : $\mathcal{U}[4, 10]$ B : $\mathcal{U}[4, 20]$ | [12] A : $\mathcal{U}[4, 12]$ B : $\mathcal{U}[4, 20]$ |
| [13] A : $\mathcal{U}[4, 14]$ B : $\mathcal{U}[4, 20]$ | [14] A : $\mathcal{U}[4, 16]$ B : $\mathcal{U}[4, 20]$ | [15] A : $\mathcal{U}[4, 18]$ B : $\mathcal{U}[4, 20]$ |
| [16] A : $\mathcal{U}[10, 16]$ B : $\mathcal{U}[10, 25]$ | [17] A : $\mathcal{U}[10, 18]$ B : $\mathcal{U}[10, 25]$ | [18] A : $\mathcal{U}[10, 20]$ B : $\mathcal{U}[10, 25]$ |
| [19] A : $\mathcal{U}[10, 22]$ B : $\mathcal{U}[10, 25]$ | [20] A : $\mathcal{U}[10, 24]$ B : $\mathcal{U}[10, 25]$ | |

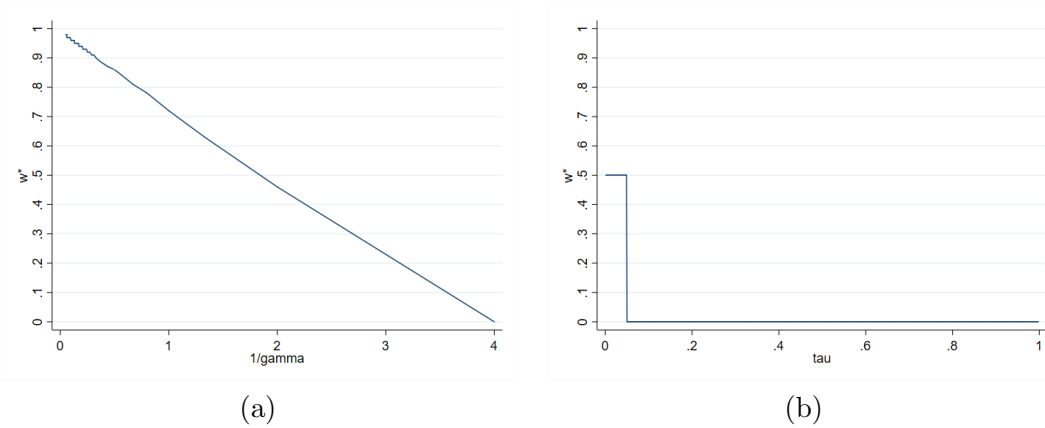
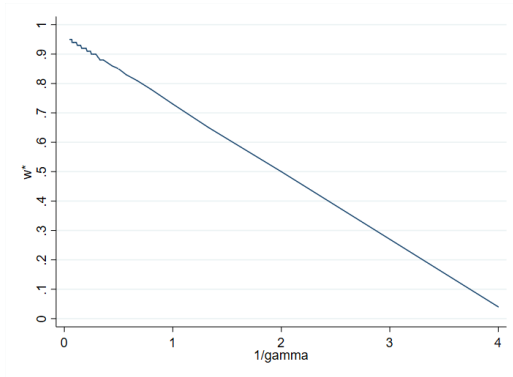
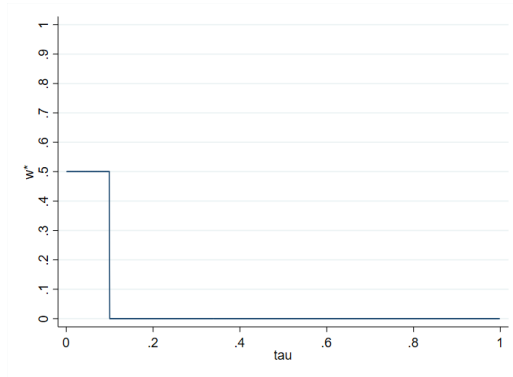


Figure 1: A : $\mathcal{U}[0, 2]$ B : $\mathcal{U}[0, 20]$

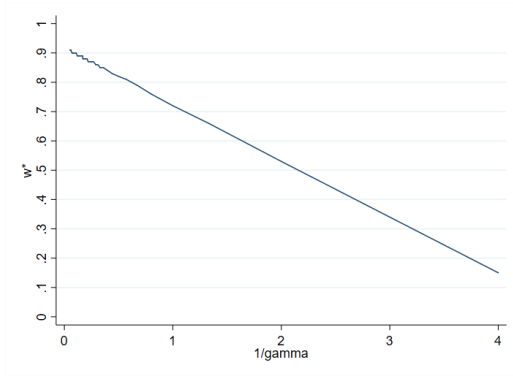


(a)

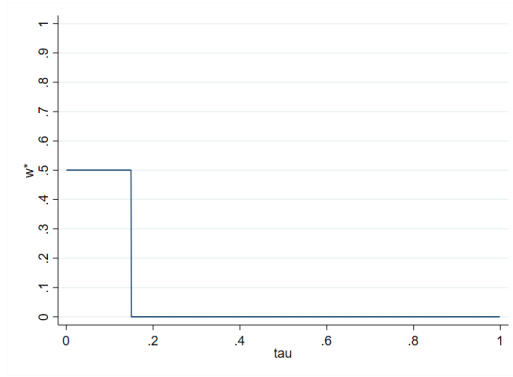


(b)

Figure 2: A : $\mathcal{U}[0, 4]$ B : $\mathcal{U}[0, 20]$

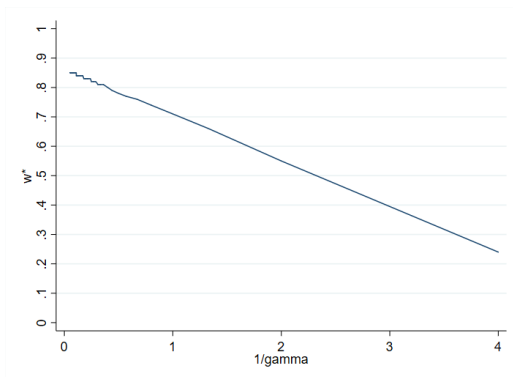


(a)

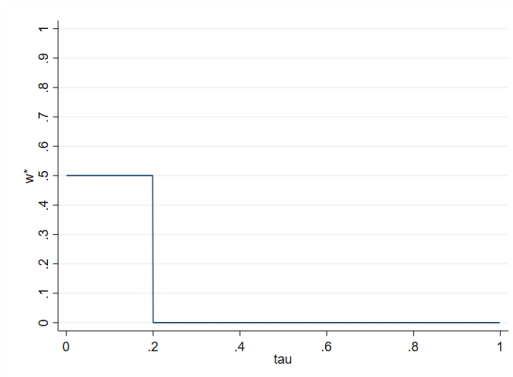


(b)

Figure 3: A : $\mathcal{U}[0, 6]$ B : $\mathcal{U}[0, 20]$

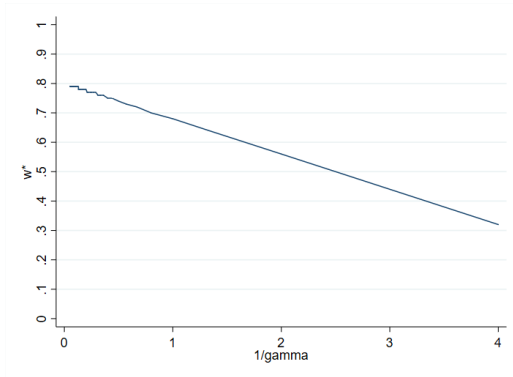


(a)

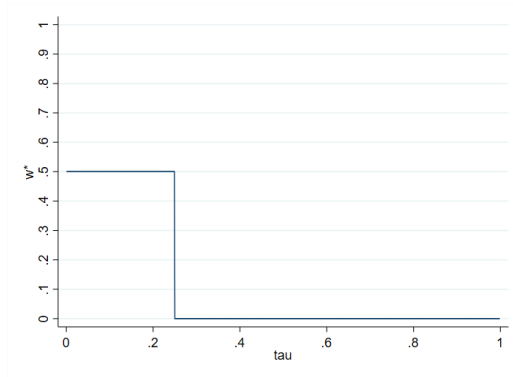


(b)

Figure 4: A : $\mathcal{U}[0, 8]$ B : $\mathcal{U}[0, 20]$

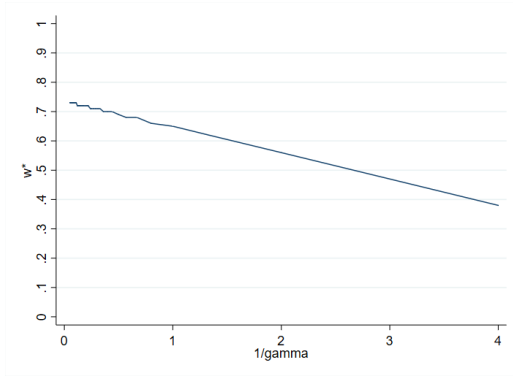


(a)

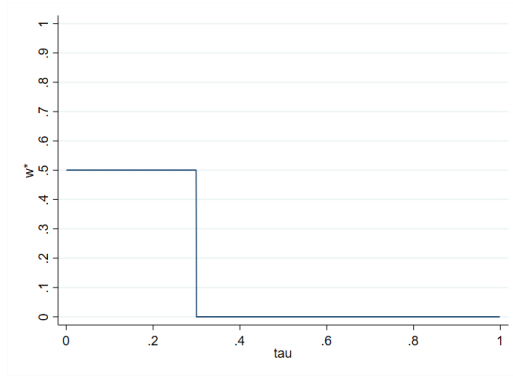


(b)

Figure 5: A : $U[0, 10]$ B : $U[0, 20]$

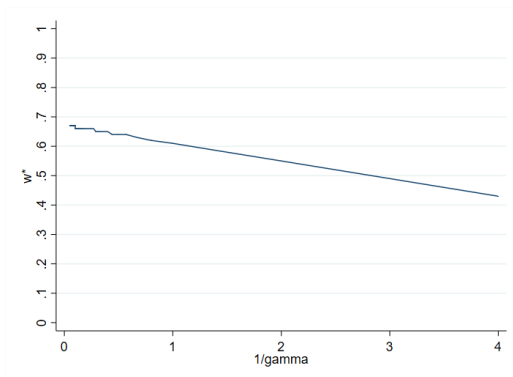


(a)

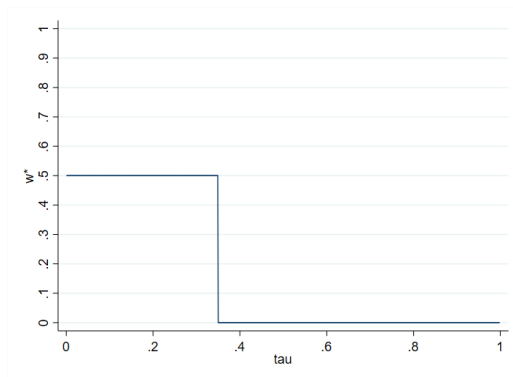


(b)

Figure 6: A : $U[0, 12]$ B : $U[0, 20]$

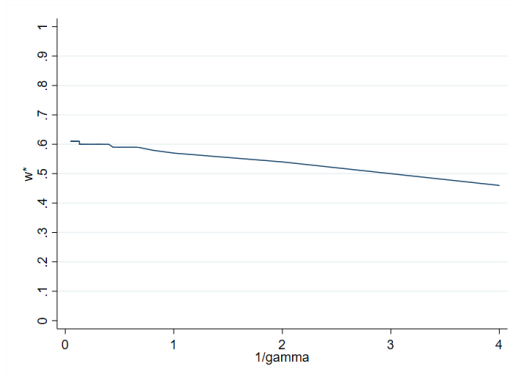


(a)

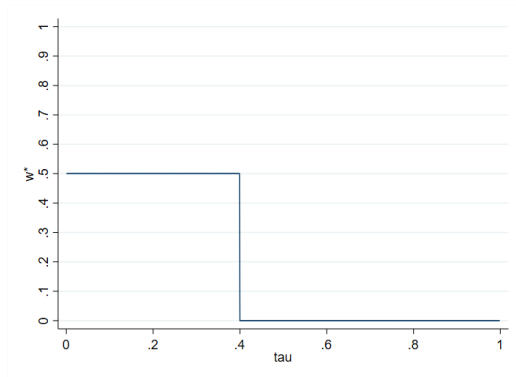


(b)

Figure 7: A : $U[0, 14]$ B : $U[0, 20]$

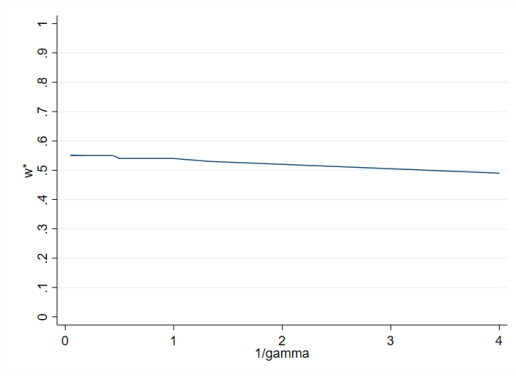


(a)

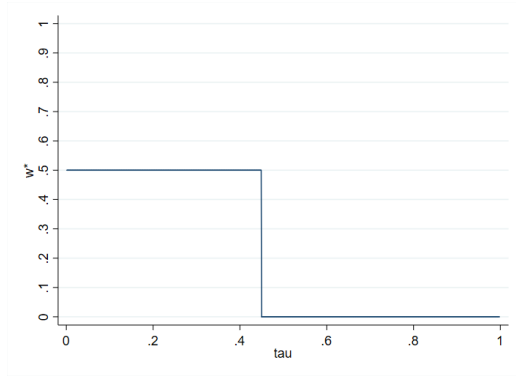


(b)

Figure 8: A : $U[0, 16]$ B : $U[0, 20]$

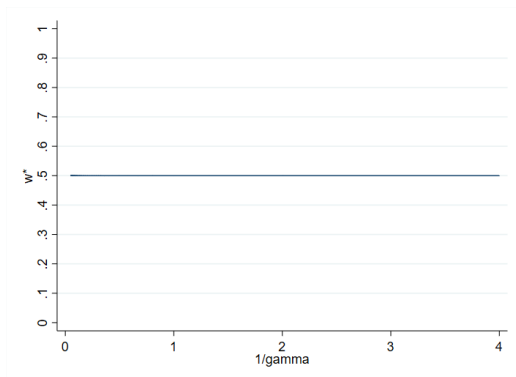


(a)

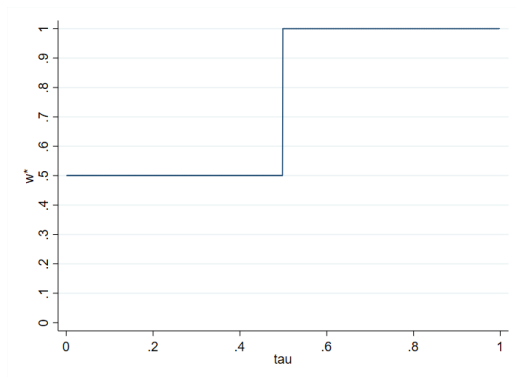


(b)

Figure 9: A : $U[0, 18]$ B : $U[0, 20]$

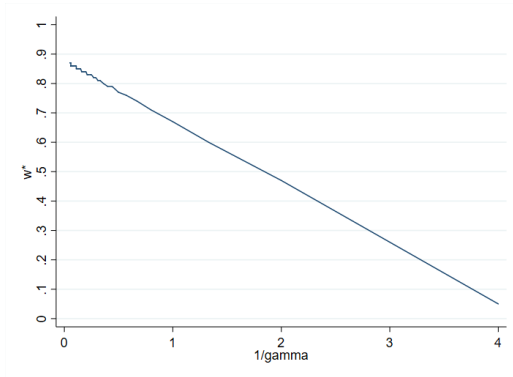


(a)

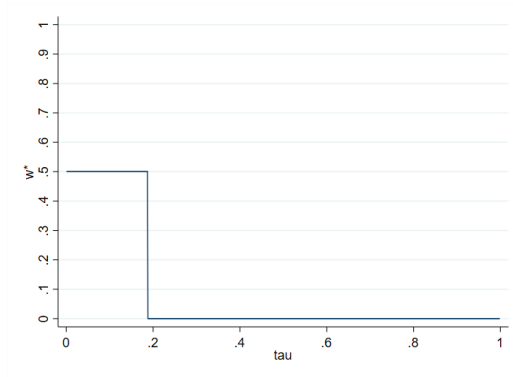


(b)

Figure 10: A : $U[0, 20]$ B : $U[0, 20]$

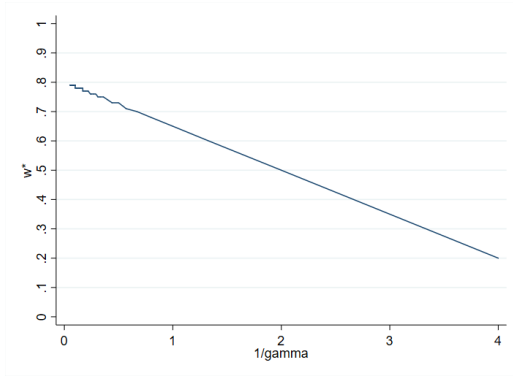


(a)

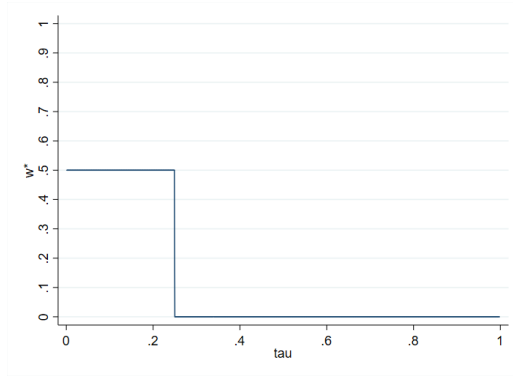


(b)

Figure 11: A : $\mathcal{U}[4, 10]$ B : $\mathcal{U}[4, 20]$

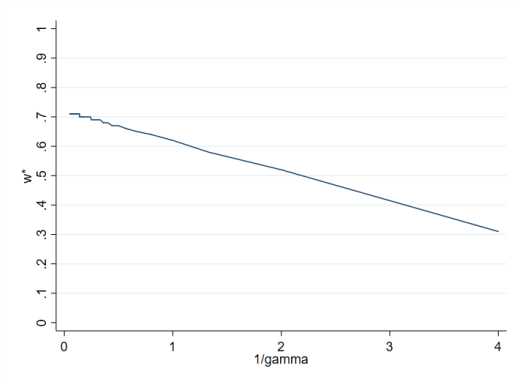


(a)

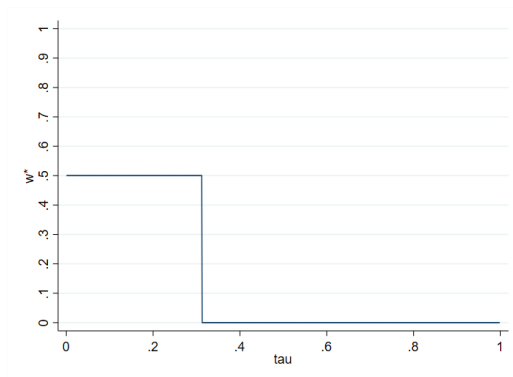


(b)

Figure 12: A : $\mathcal{U}[4, 12]$ B : $\mathcal{U}[4, 20]$

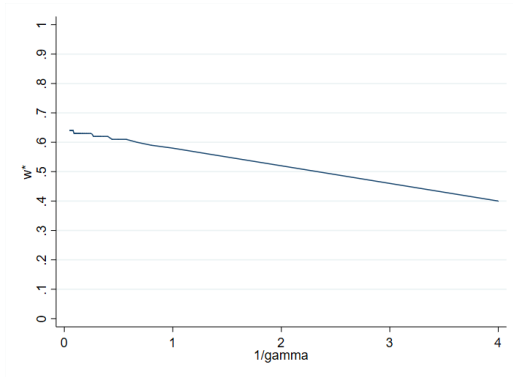


(a)

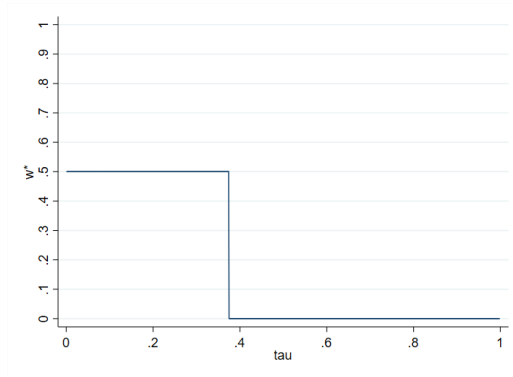


(b)

Figure 13: A : $\mathcal{U}[4, 14]$ B : $\mathcal{U}[4, 20]$

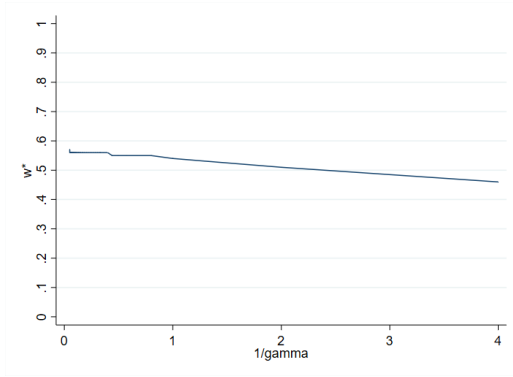


(a)

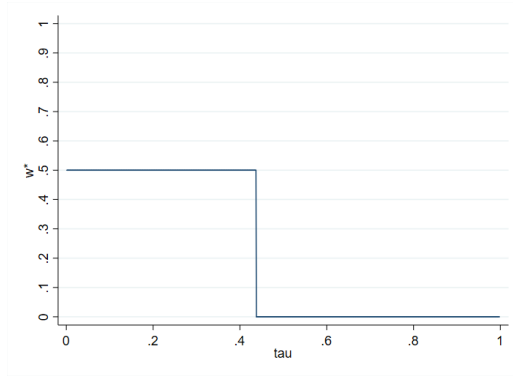


(b)

Figure 14: A : $\mathcal{U}[4, 16]$ B : $\mathcal{U}[4, 20]$

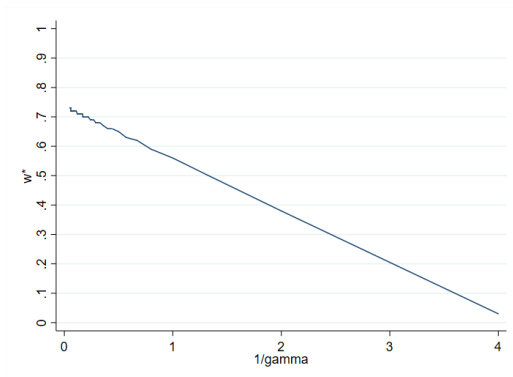


(a)

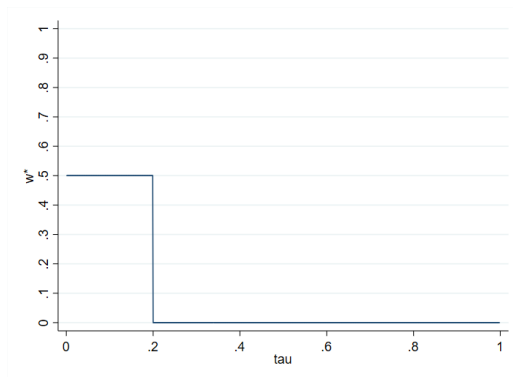


(b)

Figure 15: A : $\mathcal{U}[4, 18]$ B : $\mathcal{U}[4, 20]$

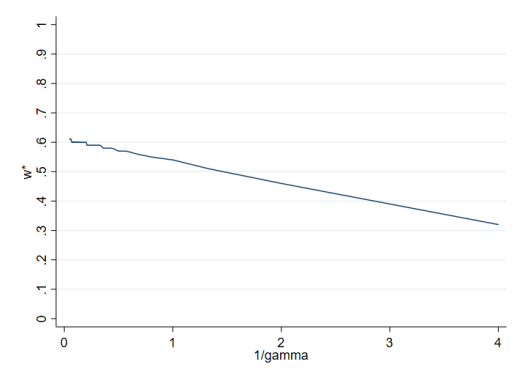


(a)

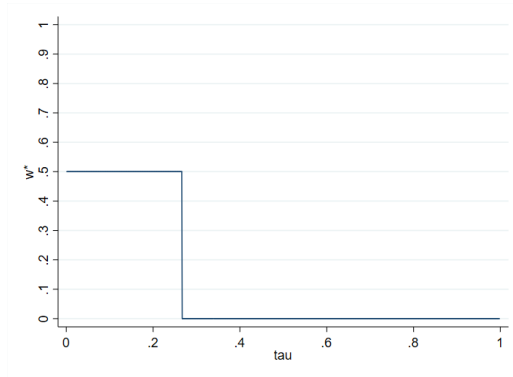


(b)

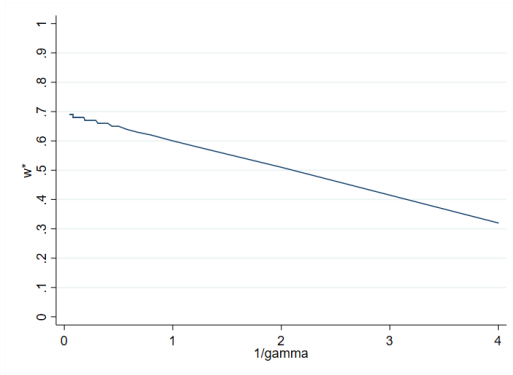
Figure 16: A : $\mathcal{U}[10, 16]$ B : $\mathcal{U}[10, 25]$



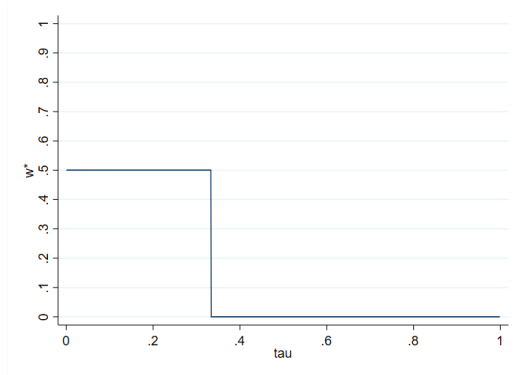
(a)



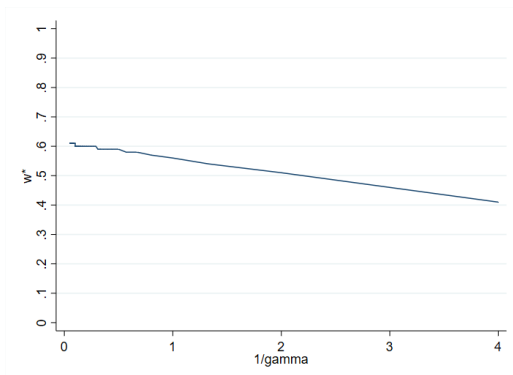
(b)

Figure 17: A : $U[10, 18]$ B : $U[10, 25]$ 

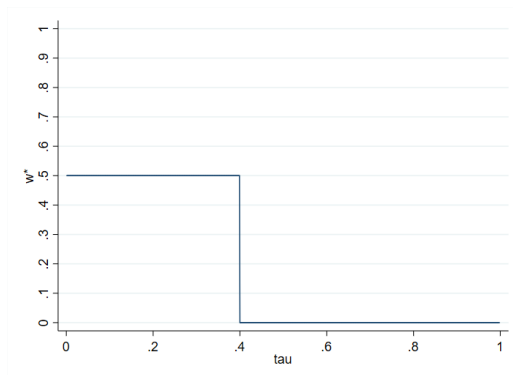
(a)



(b)

Figure 18: A : $U[10, 20]$ B : $U[10, 25]$ 

(a)



(b)

Figure 19: A : $U[10, 22]$ B : $U[10, 25]$

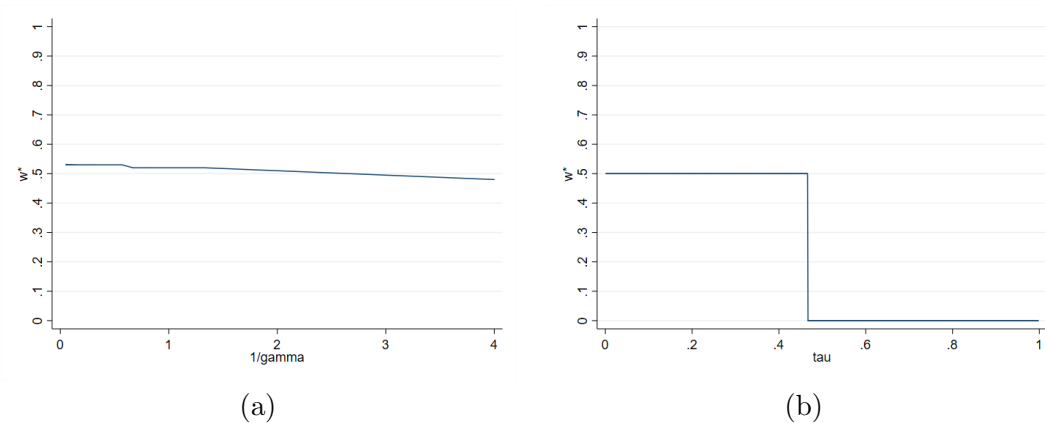


Figure 20: $A : U[10, 24]$ $B : U[10, 25]$

3.2 Experiments replicating Example 2.3:

In these examples, lottery A first order stochastically dominates lottery B. Note that there are different lower ends of the distributions.

- [21] $A : U[2, 20]$ $B : U[0, 20]$ [22] $A : U[4, 20]$ $B : U[0, 20]$ [23] $A : U[8, 20]$ $B : U[0, 20]$
- [24] $A : U[12, 20]$ $B : U[0, 20]$ [25] $A : U[16, 20]$ $B : U[0, 20]$ [26] $A : U[4, 25]$ $B : U[0, 25]$.
- [27] $A : U[8, 25]$ $B : U[0, 25]$ [28] $A : U[12, 25]$ $B : U[0, 25]$ [29] $A : U[16, 25]$ $B : U[0, 25]$
- [30] $A : U[20, 25]$ $B : U[0, 25]$ [31] $A : U[2, 10]$ $B : U[0, 10]$ [32] $A : U[4, 10]$ $B : U[0, 10]$
- [33] $A : U[6, 10]$ $B : U[0, 10]$ [34] $A : U[8, 10]$ $B : U[0, 10]$ [35] $A : U[10, 15]$ $B : U[0, 15]$

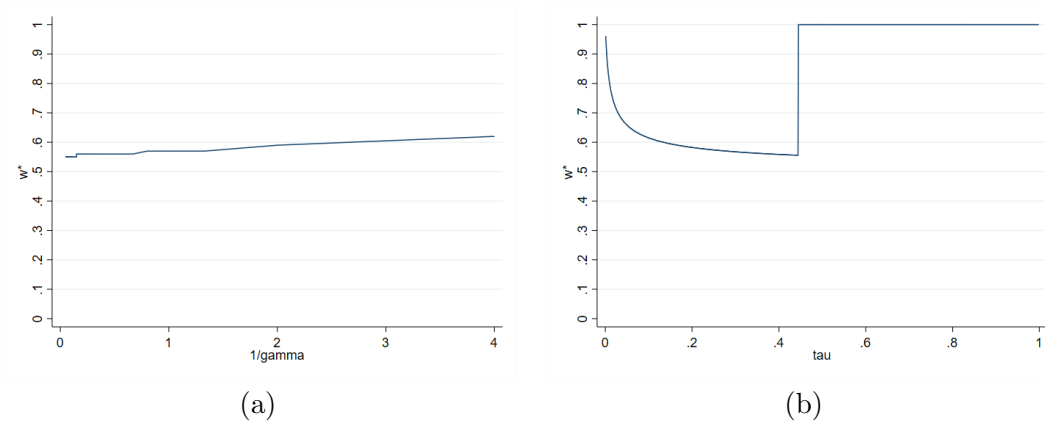
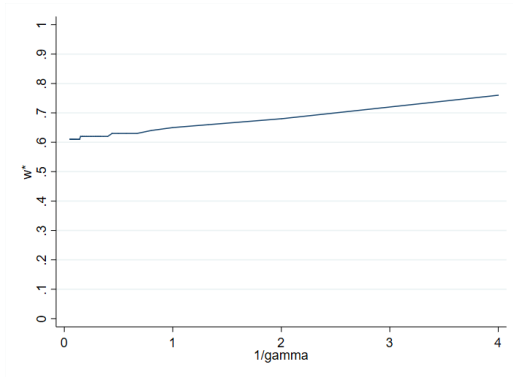
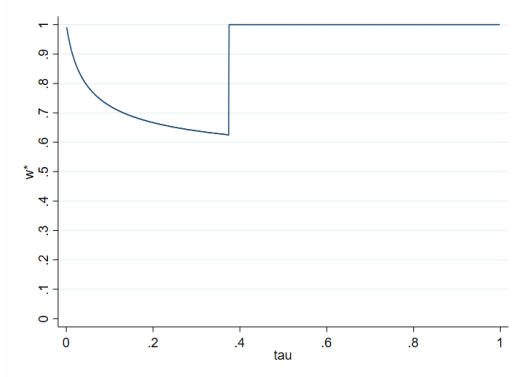


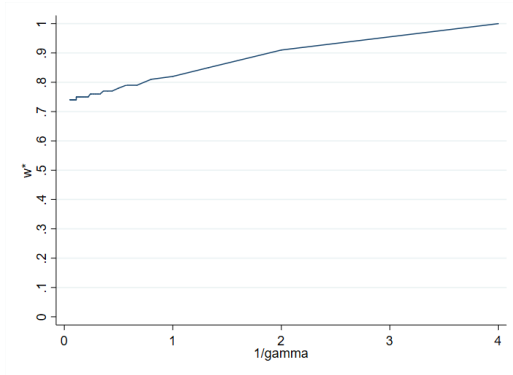
Figure 21: $A : U[2, 20]$ $B : U[0, 20]$



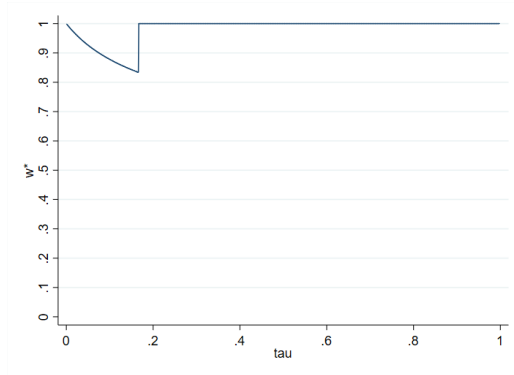
(a)



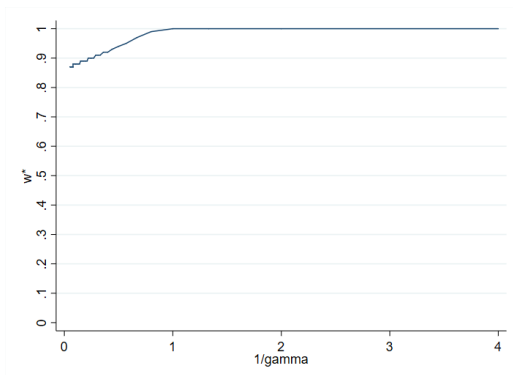
(b)

Figure 22: A : $\mathcal{U}[4, 20]$ B : $\mathcal{U}[0, 20]$ 

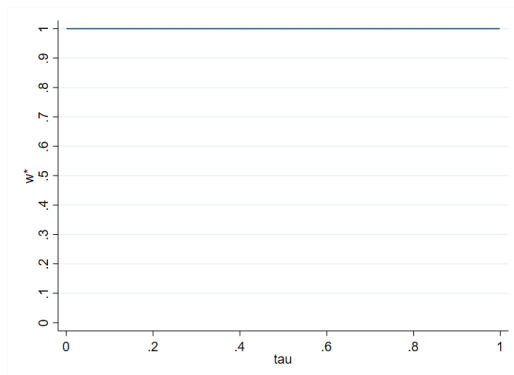
(a)



(b)

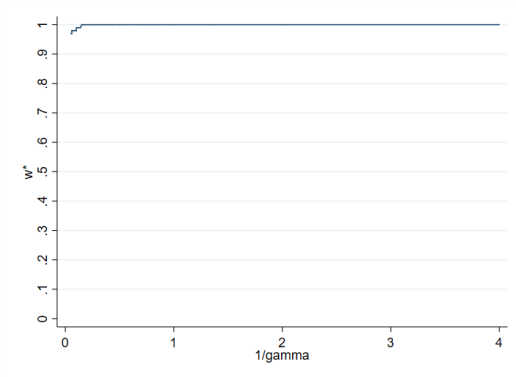
Figure 23: A : $\mathcal{U}[8, 20]$ B : $\mathcal{U}[0, 20]$ 

(a)

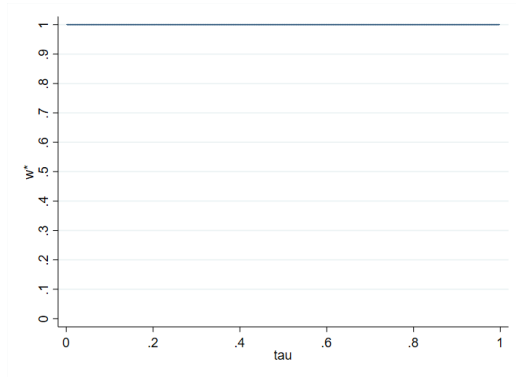


(b)

Figure 24: A : $\mathcal{U}[12, 20]$ B : $\mathcal{U}[0, 20]$

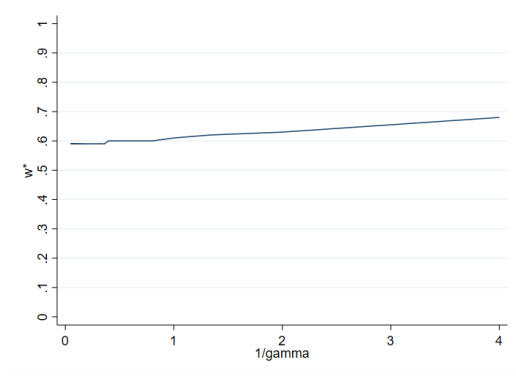


(a)

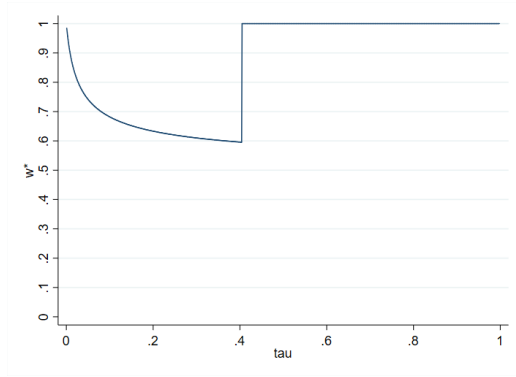


(b)

Figure 25: A : $\mathcal{U}[16, 20]$ B : $\mathcal{U}[0, 20]$

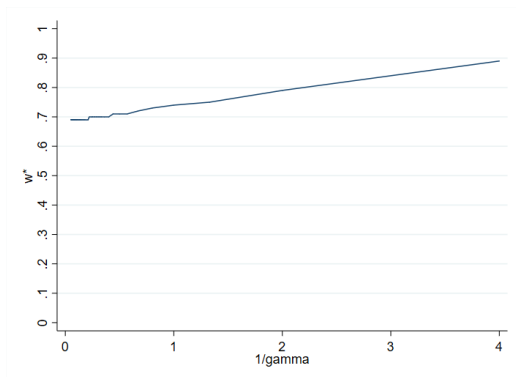


(a)

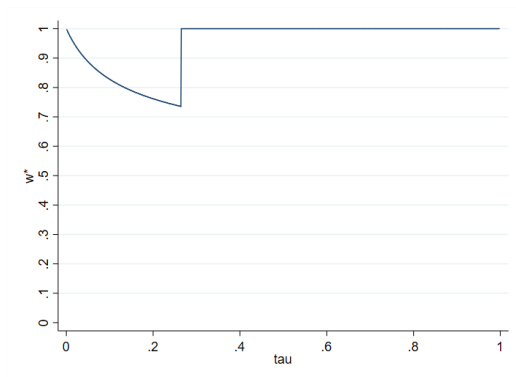


(b)

Figure 26: A : $\mathcal{U}[4, 25]$ B : $\mathcal{U}[0, 25]$

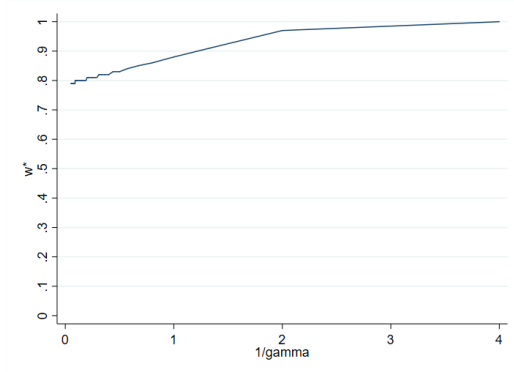


(a)

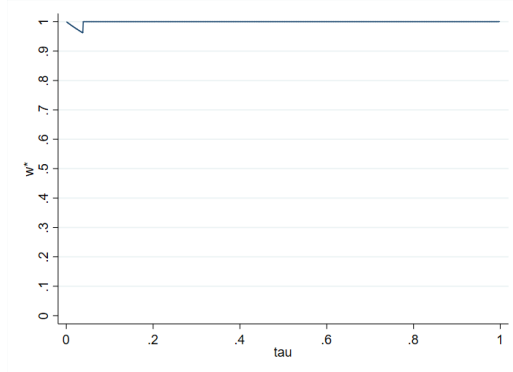


(b)

Figure 27: $\mathcal{U}[8, 25]$ B : $\mathcal{U}[0, 25]$

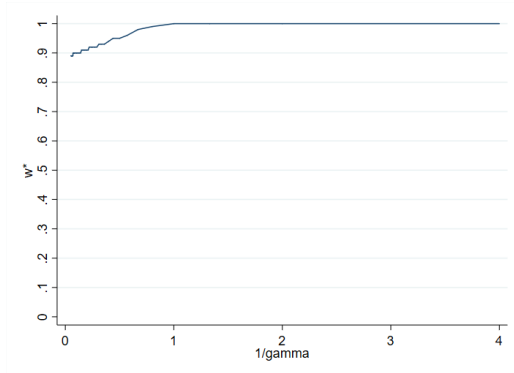


(a)

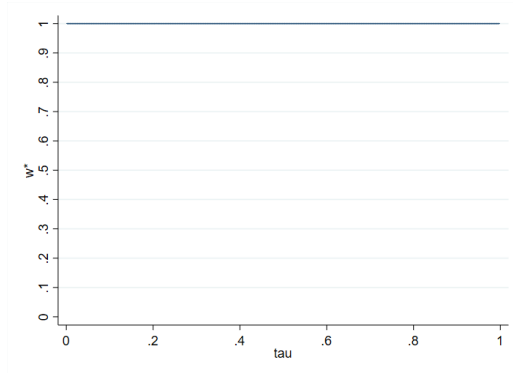


(b)

Figure 28: A : $\mathcal{U}[12, 25]$ B : $\mathcal{U}[0, 25]$

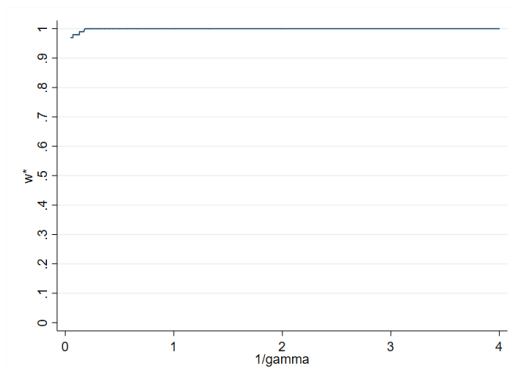


(a)

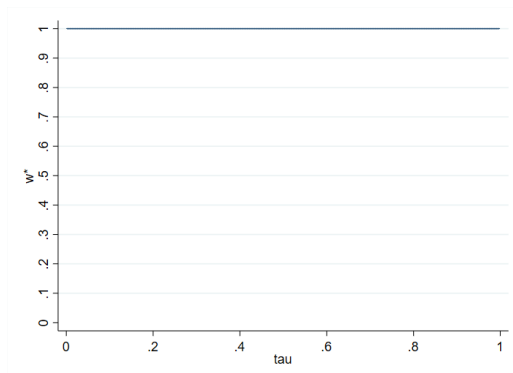


(b)

Figure 29: A : $\mathcal{U}[16, 25]$ B : $\mathcal{U}[0, 25]$

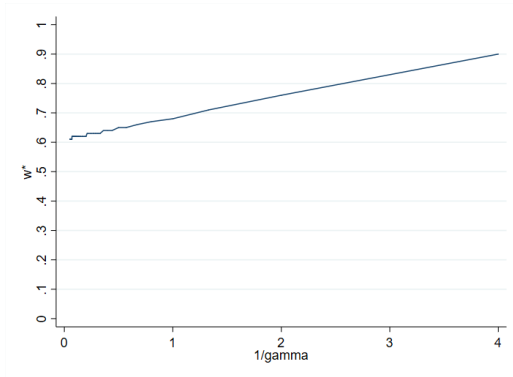


(a)

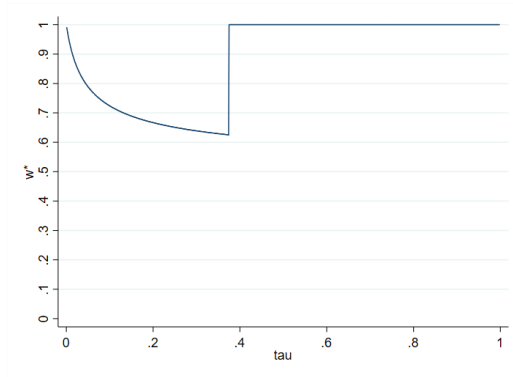


(b)

Figure 30: A : $\mathcal{U}[20, 25]$ B : $\mathcal{U}[0, 25]$

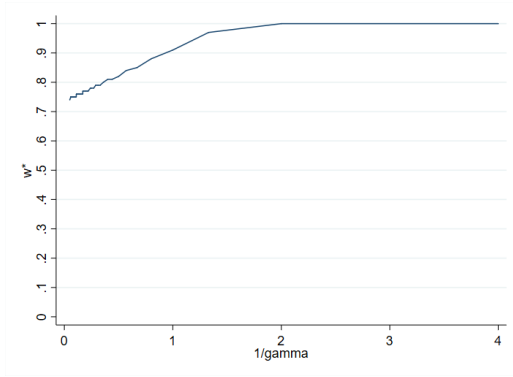


(a)

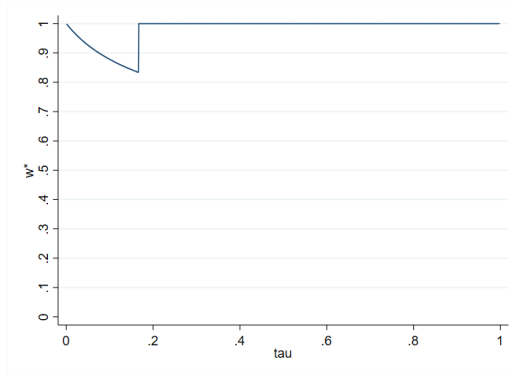


(b)

Figure 31: A : $\mathcal{U}[2, 10]$ B : $\mathcal{U}[0, 10]$

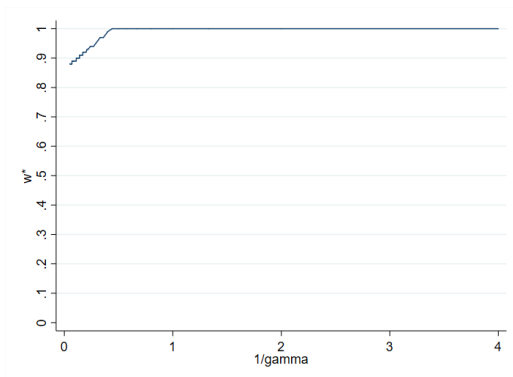


(a)

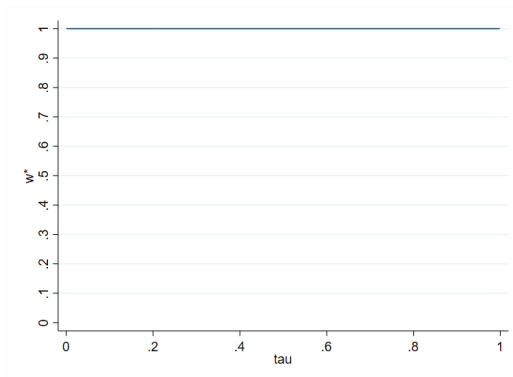


(b)

Figure 32: A : $\mathcal{U}[4, 10]$ B : $\mathcal{U}[0, 10]$



(a)



(b)

Figure 33: A : $\mathcal{U}[6, 10]$ B : $\mathcal{U}[0, 10]$

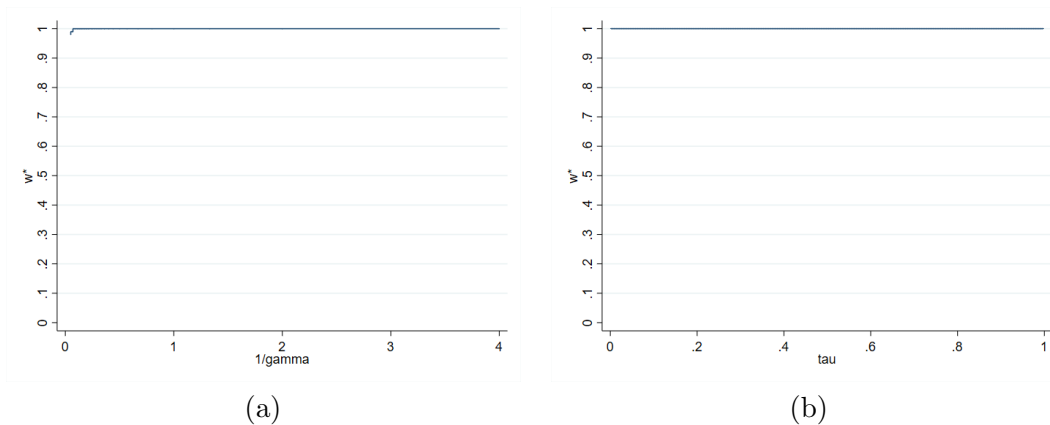


Figure 34: $A : \mathcal{U}[8, 10]$ $B : \mathcal{U}[0, 10]$

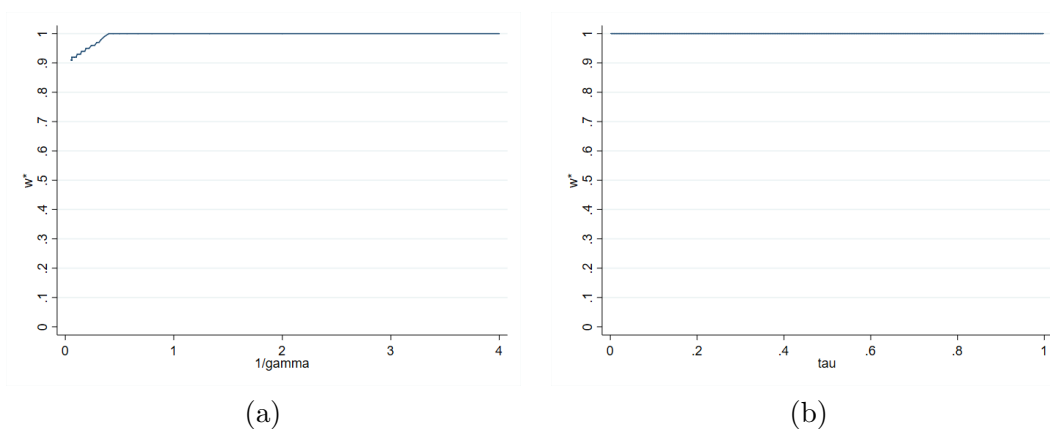
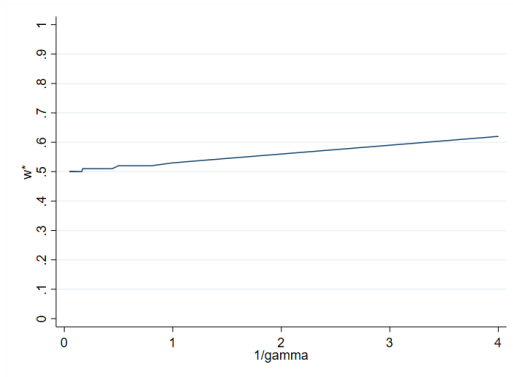


Figure 35: $A : \mathcal{U}[10, 15]$ $B : \mathcal{U}[0, 15]$

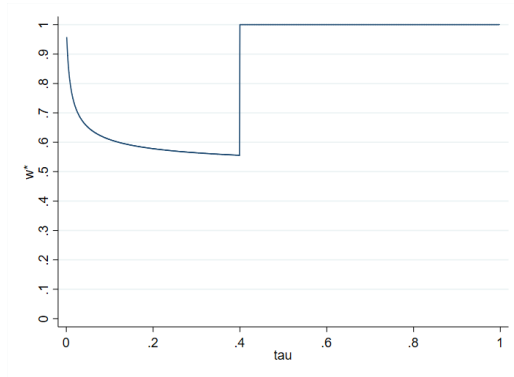
3.3 Experiments replicating Example 2.4:

In these examples, lottery A stochastically dominates lottery B. The support of the random variables overlaps.

- | | | |
|----------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------|
| [36] $A : \mathcal{U}[2, 22]$ $B : \mathcal{U}[0, 20]$ | [37] $A : \mathcal{U}[4, 24]$ $B : \mathcal{U}[0, 20]$ | [38] $A : \mathcal{U}[6, 26]$ $B : \mathcal{U}[0, 20]$ |
| [39] $A : \mathcal{U}[8, 28]$ $B : \mathcal{U}[0, 20]$ | [40] $A : \mathcal{U}[10, 30]$ $B : \mathcal{U}[0, 20]$ | [41] $A : \mathcal{U}[12, 32]$ $B : \mathcal{U}[0, 20]$ |
| [42] $A : \mathcal{U}[14, 34]$ $B : \mathcal{U}[0, 20]$ | [43] $A : \mathcal{U}[16, 36]$ $B : \mathcal{U}[0, 20]$ | [44] $A : \mathcal{U}[18, 38]$ $B : \mathcal{U}[0, 20]$ |
| [45] $A : \mathcal{U}[16, 26]$ $B : \mathcal{U}[10, 20]$ | [46] $A : \mathcal{U}[2, 12]$ $B : \mathcal{U}[0, 10]$ | [47] $A : \mathcal{U}[14, 30]$ $B : \mathcal{U}[0, 16]$ |
| [48] $A : \mathcal{U}[12, 28]$ $B : \mathcal{U}[0, 16]$ | [49] $A : \mathcal{U}[10, 26]$ $B : \mathcal{U}[0, 16]$ | [50] $A : \mathcal{U}[8, 24]$ $B : \mathcal{U}[0, 16]$ |
| [51] $A : \mathcal{U}[6, 22]$ $B : \mathcal{U}[0, 16]$ | [52] $A : \mathcal{U}[4, 20]$ $B : \mathcal{U}[0, 16]$ | [53] $A : \mathcal{U}[2, 18]$ $B : \mathcal{U}[0, 16]$ |
| [54] $A : \mathcal{U}[2, 16]$ $B : \mathcal{U}[0, 14]$ | [55] $A : \mathcal{U}[4, 18]$ $B : \mathcal{U}[0, 14]$. | |

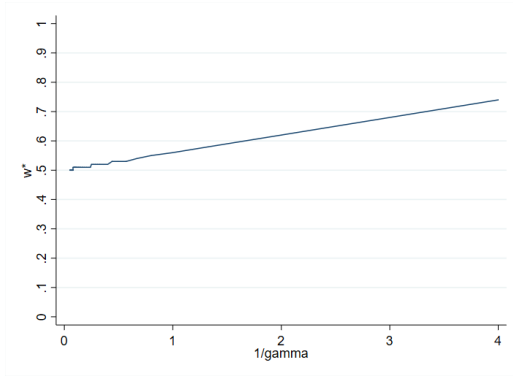


(a)

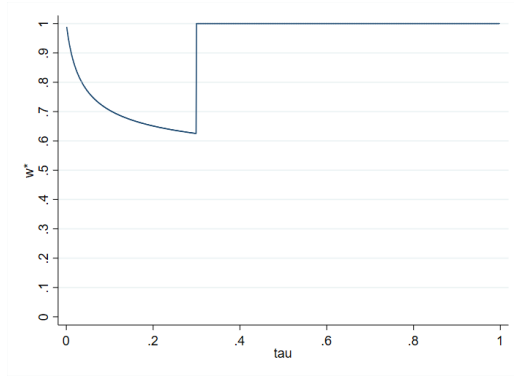


(b)

Figure 36: A : $\mathcal{U}[2, 22]$ B : $\mathcal{U}[0, 20]$

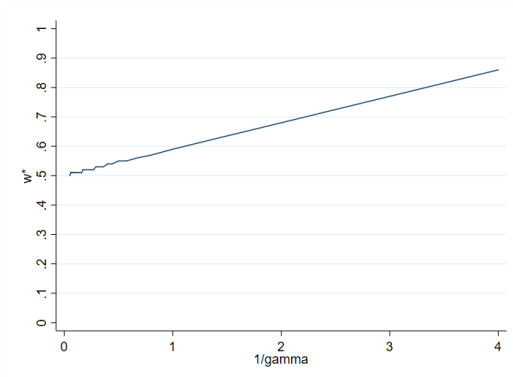


(a)

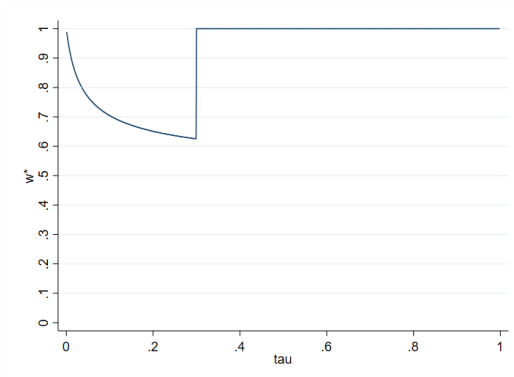


(b)

Figure 37: A : $\mathcal{U}[4, 24]$ B : $\mathcal{U}[0, 20]$

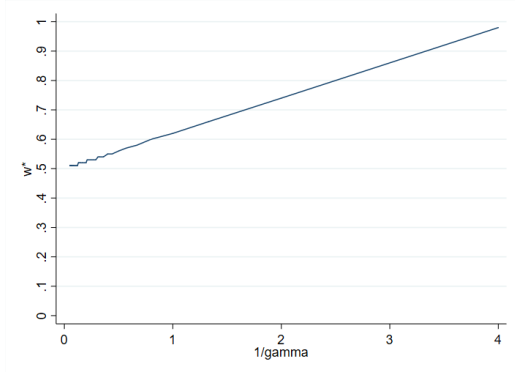


(a)

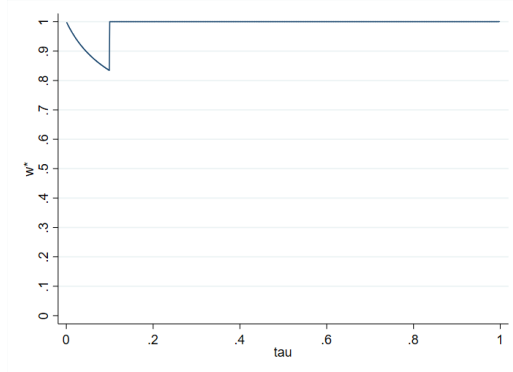


(b)

Figure 38: A : $\mathcal{U}[6, 26]$ B : $\mathcal{U}[0, 20]$

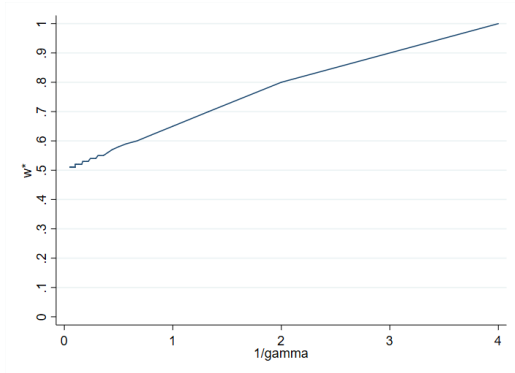


(a)

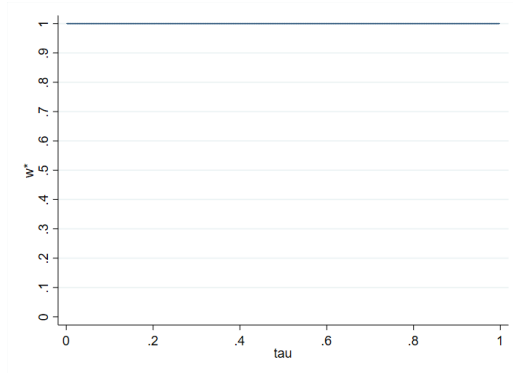


(b)

Figure 39: A : $U[8, 28]$ B : $U[0, 20]$

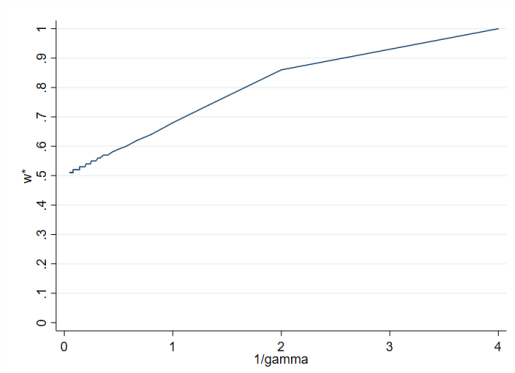


(a)

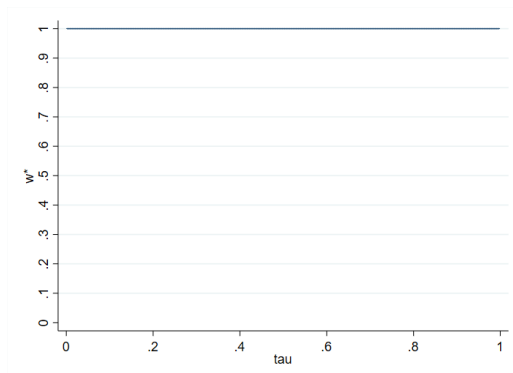


(b)

Figure 40: A : $U[10, 30]$ B : $U[0, 20]$

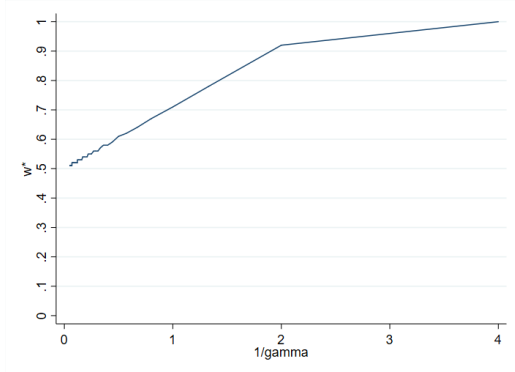


(a)

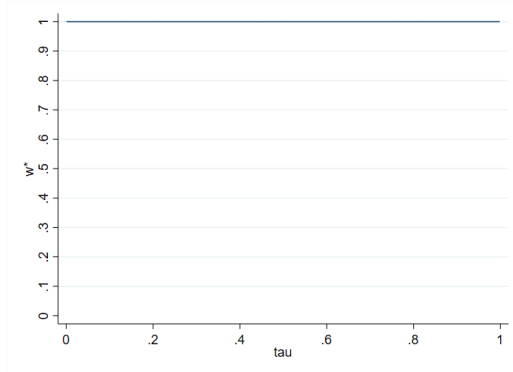


(b)

Figure 41: A : $U[12, 32]$ B : $U[0, 20]$

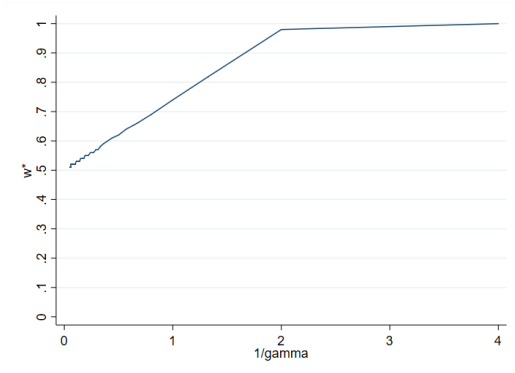


(a)

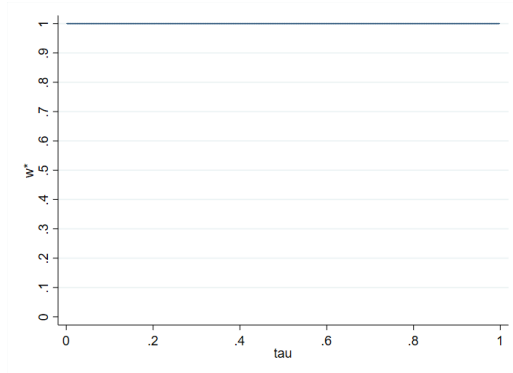


(b)

Figure 42: A : U[14, 34] B : U[0, 20]

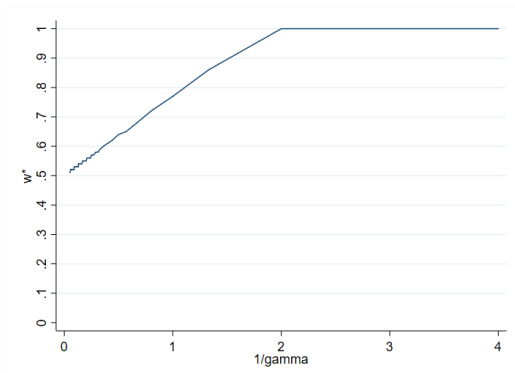


(a)

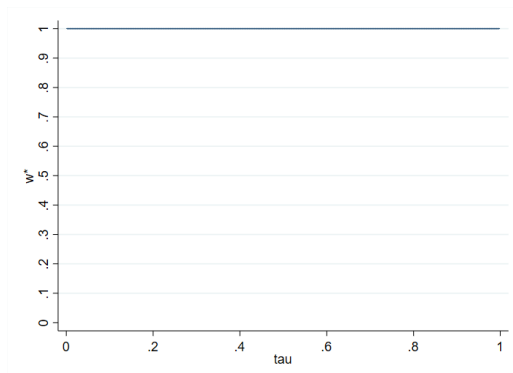


(b)

Figure 43: A : U[16, 36] B : U[0, 20]

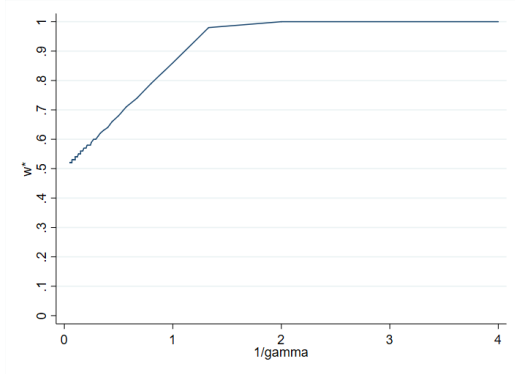


(a)

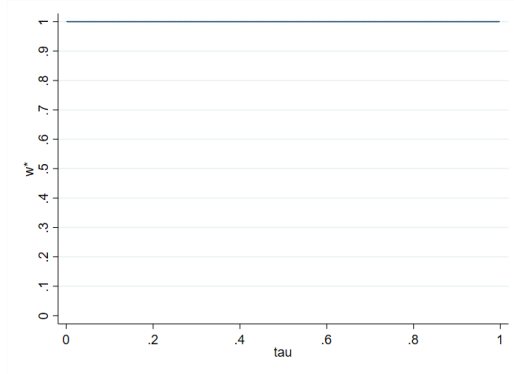


(b)

Figure 44: A : U[18, 38] B : U[0, 20]

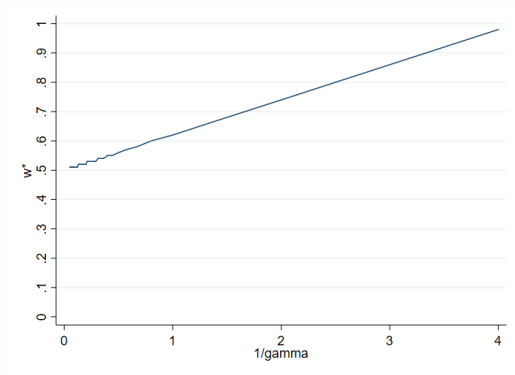


(a)

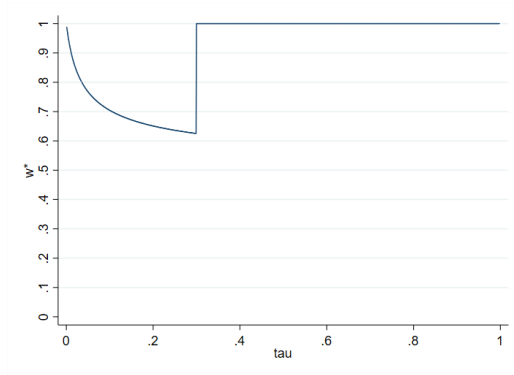


(b)

Figure 45: A : $\mathcal{U}[16, 26]$ B : $\mathcal{U}[10, 20]$

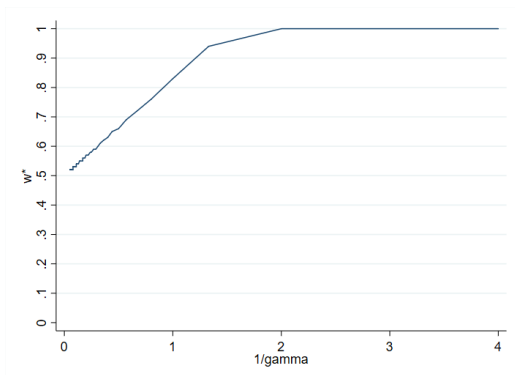


(a)

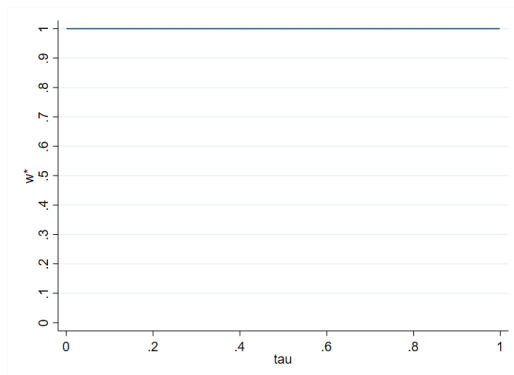


(b)

Figure 46: A : $\mathcal{U}[2, 12]$ B : $\mathcal{U}[0, 10]$

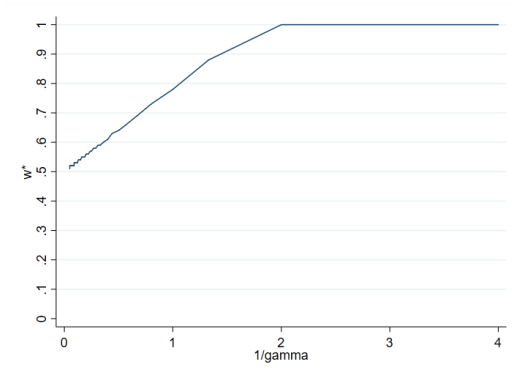


(a)

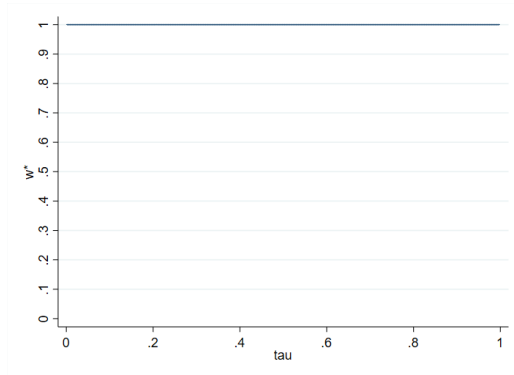


(b)

Figure 47: A : $\mathcal{U}[14, 30]$ B : $\mathcal{U}[0, 16]$

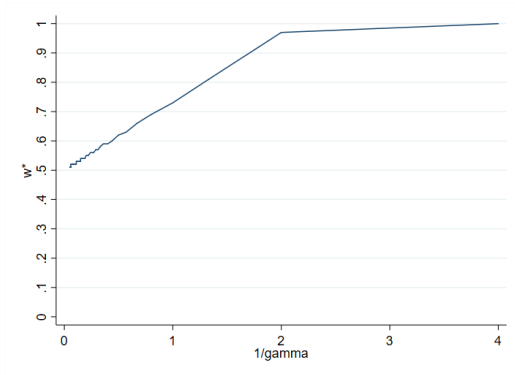


(a)

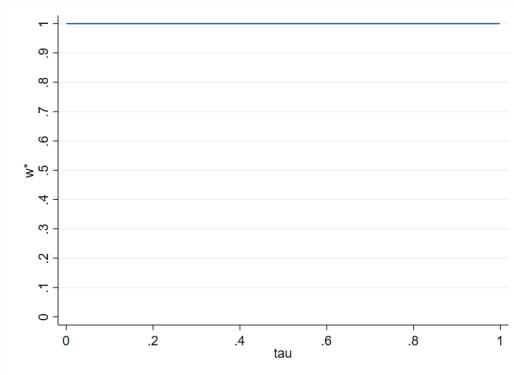


(b)

Figure 48: A : $U[12, 28]$ B : $U[0, 16]$

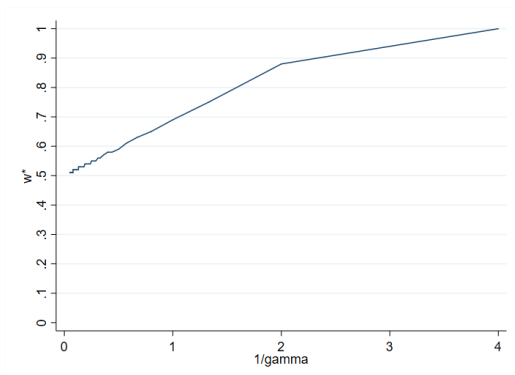


(a)

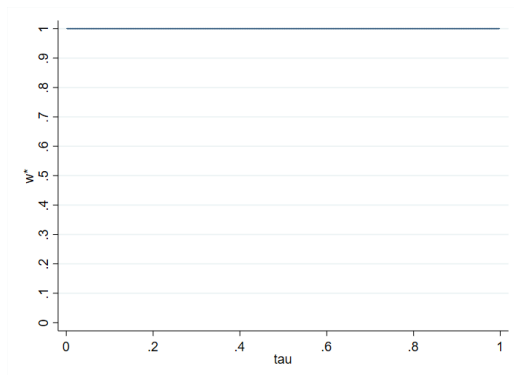


(b)

Figure 49: A : $U[10, 26]$ B : $U[0, 16]$

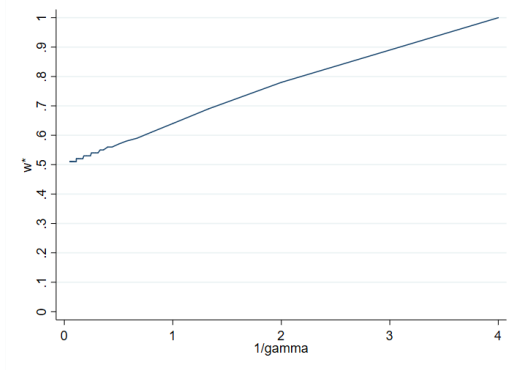


(a)

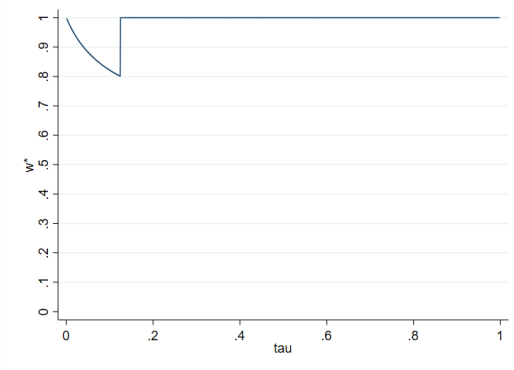


(b)

Figure 50: A : $U[8, 24]$ B : $U[0, 16]$

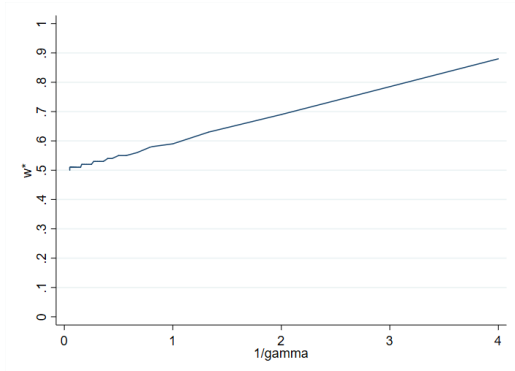


(a)

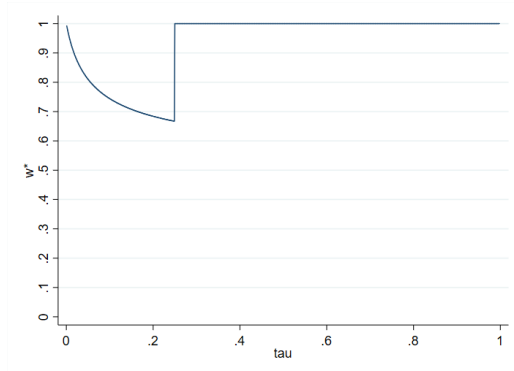


(b)

Figure 51: A : $\mathcal{U}[6, 22]$ B : $\mathcal{U}[0, 16]$

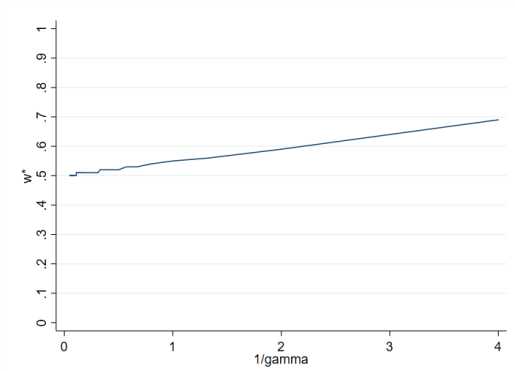


(a)

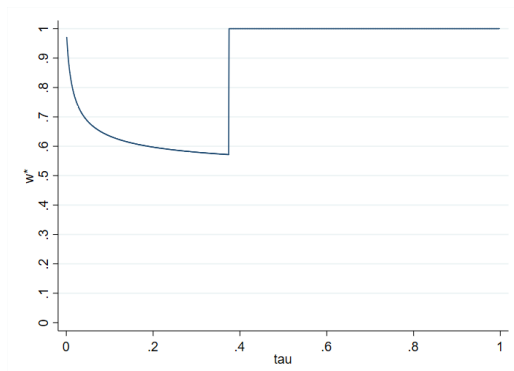


(b)

Figure 52: A : $\mathcal{U}[4, 20]$ B : $\mathcal{U}[0, 16]$



(a)



(b)

Figure 53: A : $\mathcal{U}[2, 18]$ B : $\mathcal{U}[0, 16]$

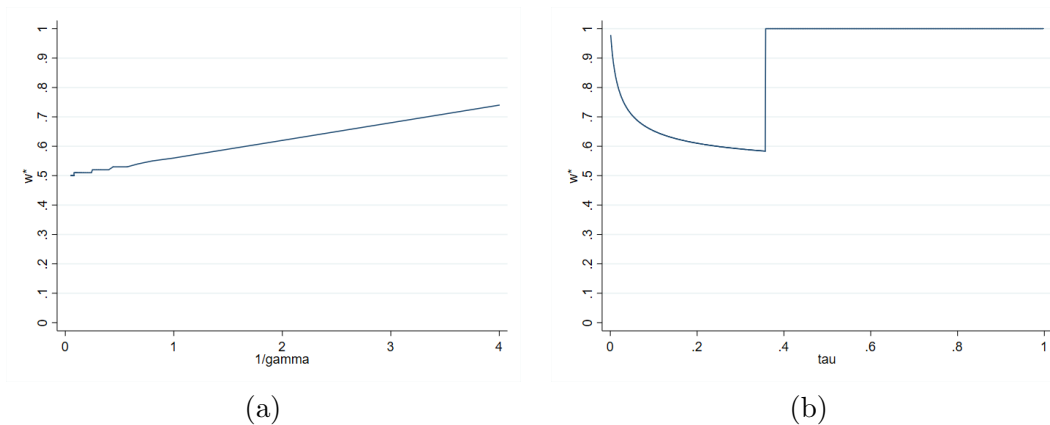


Figure 54: A : $\mathcal{U}[2, 16]$ B : $\mathcal{U}[0, 14]$

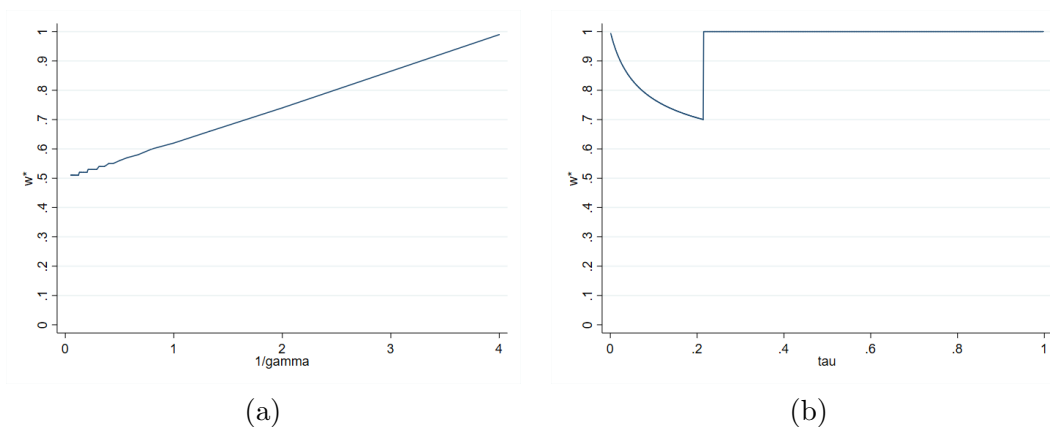
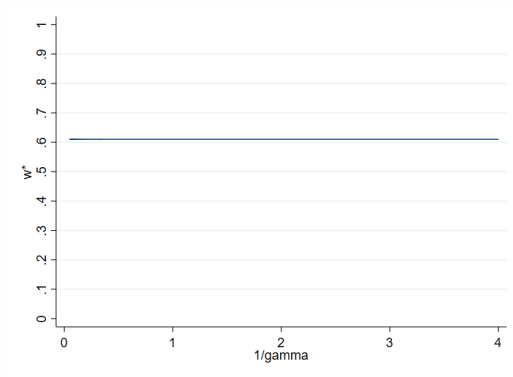


Figure 55: A : $\mathcal{U}[4, 18]$ B : $\mathcal{U}[0, 14]$

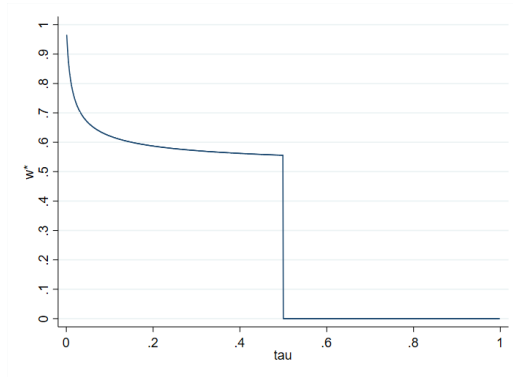
3.4 Experiments replicating Example 2.5:

In these examples, there is no stochastic dominance on either side.

- | | | |
|----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| [56] A : $\mathcal{U}[2, 18]$ B : $\mathcal{U}[0, 20]$ | [57] A : $\mathcal{U}[4, 16]$ B : $\mathcal{U}[0, 20]$ | [58] A : $\mathcal{U}[6, 14]$ B : $\mathcal{U}[0, 20]$ |
| [59] A : $\mathcal{U}[8, 12]$ B : $\mathcal{U}[0, 20]$ | [60] A : $\mathcal{U}[6, 22]$ B : $\mathcal{U}[4, 24]$ | [61] A : $\mathcal{U}[8, 22]$ B : $\mathcal{U}[4, 24]$ |
| [62] A : $\mathcal{U}[6, 20]$ B : $\mathcal{U}[4, 24]$ | [63] A : $\mathcal{U}[8, 20]$ B : $\mathcal{U}[4, 24]$ | [64] A : $\mathcal{U}[12, 18]$ B : $\mathcal{U}[10, 20]$ |
| [65] A : $\mathcal{U}[14, 18]$ B : $\mathcal{U}[10, 20]$ | [66] A : $\mathcal{U}[16, 18]$ B : $\mathcal{U}[10, 20]$ | [67] A : $\mathcal{U}[14, 16]$ B : $\mathcal{U}[12, 20]$ |
| [68] A : $\mathcal{U}[13, 17]$ B : $\mathcal{U}[12, 18]$ | [69] A : $\mathcal{U}[14, 16]$ B : $\mathcal{U}[12, 18]$ | |

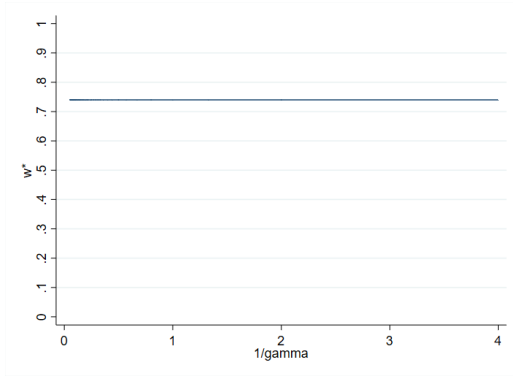


(a)

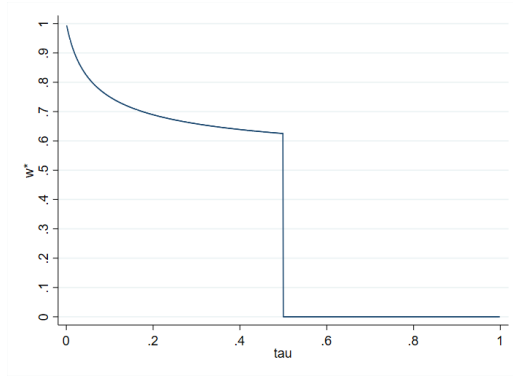


(b)

Figure 56: A : $\mathcal{U}[2, 18]$ B : $\mathcal{U}[0, 20]$.

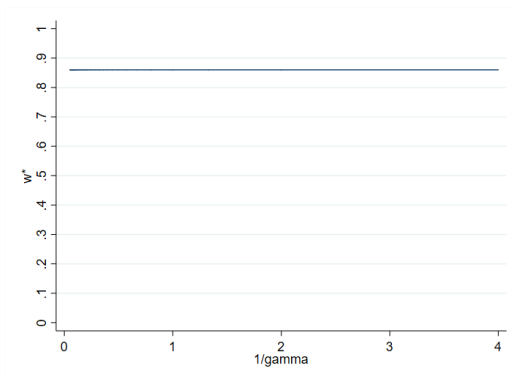


(a)

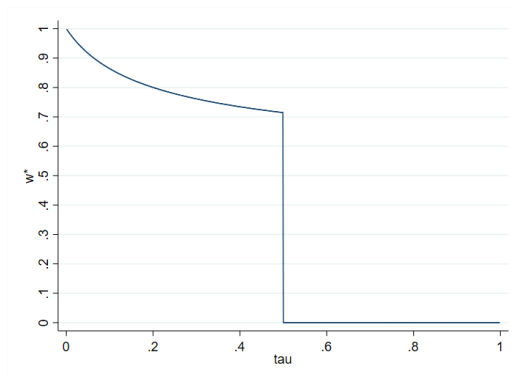


(b)

Figure 57: A : $\mathcal{U}[4, 16]$ B : $\mathcal{U}[0, 20]$.

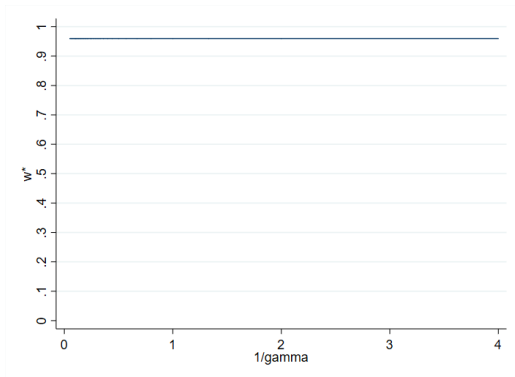


(a)

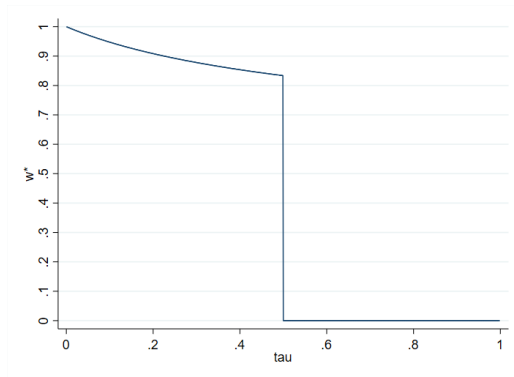


(b)

Figure 58: A : $\mathcal{U}[6, 14]$ B : $\mathcal{U}[0, 20]$.

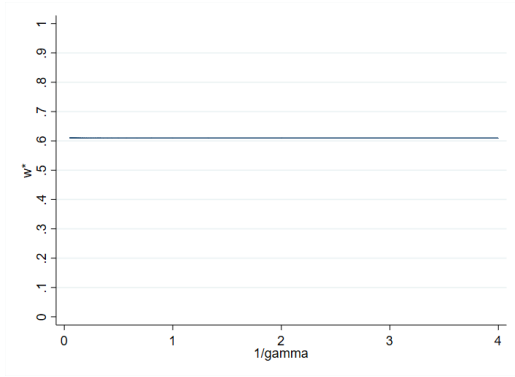


(a)

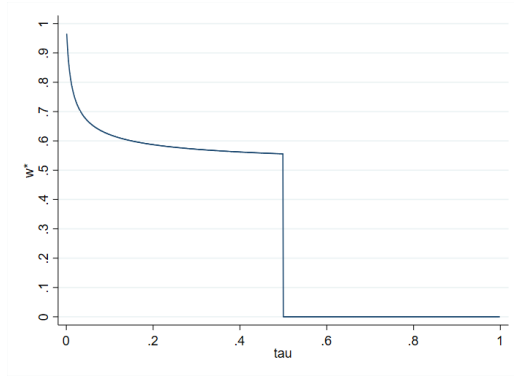


(b)

Figure 59: A : $\mathcal{U}[8, 12]$ B : $\mathcal{U}[0, 20]$.

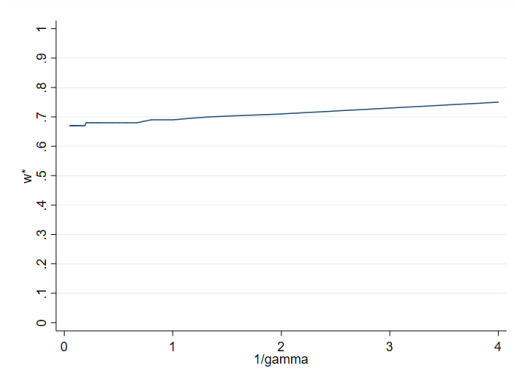


(a)

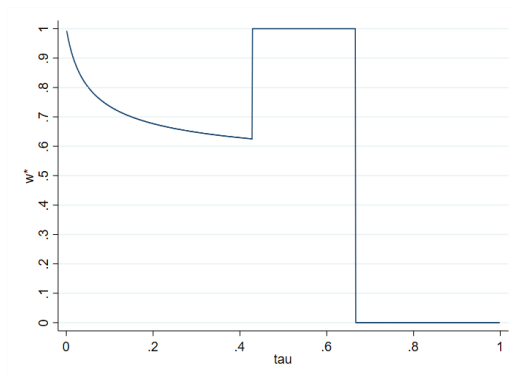


(b)

Figure 60: A : $\mathcal{U}[6, 22]$ B : $\mathcal{U}[4, 24]$

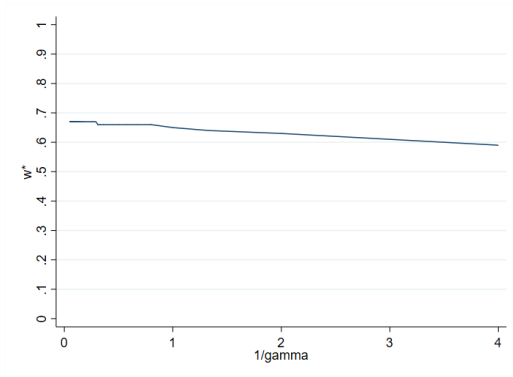


(a)

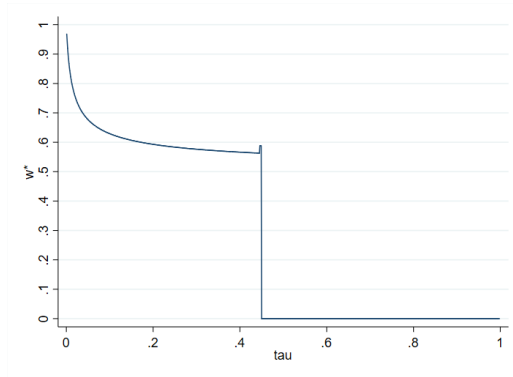


(b)

Figure 61: A : $\mathcal{U}[8, 22]$ B : $\mathcal{U}[4, 24]$

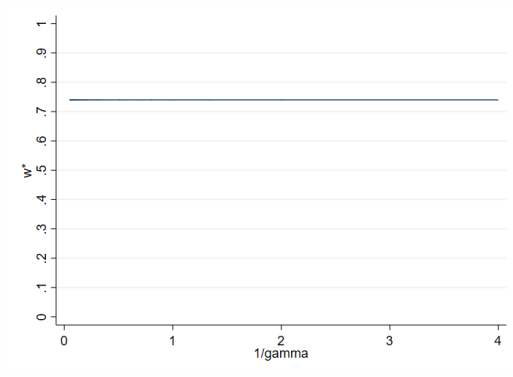


(a)

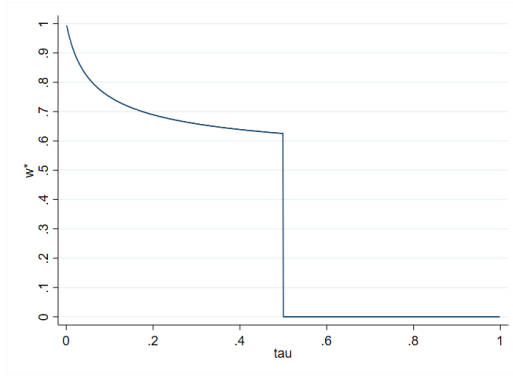


(b)

Figure 62: A : $\mathcal{U}[6, 20]$ B : $\mathcal{U}[4, 24]$

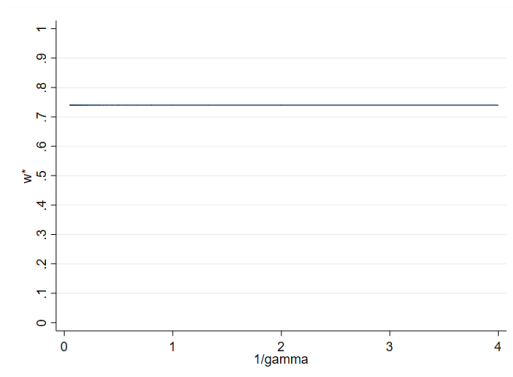


(a)

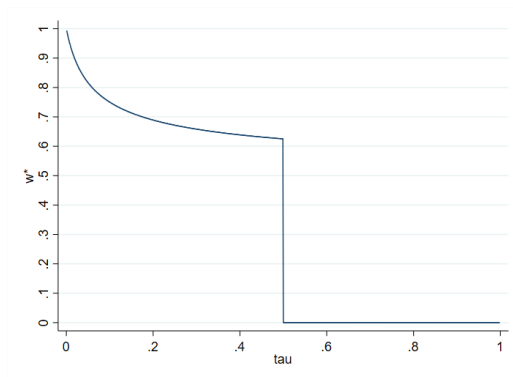


(b)

Figure 63: A : $\mathcal{U}[8, 20]$ B : $\mathcal{U}[4, 24]$

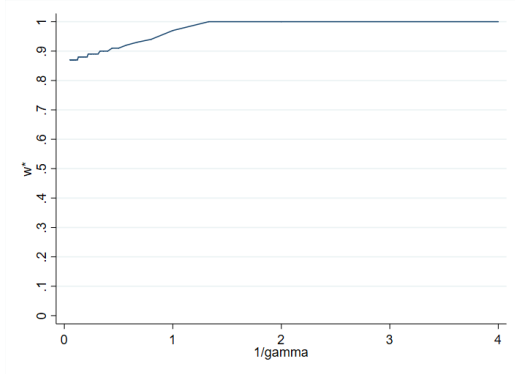


(a)

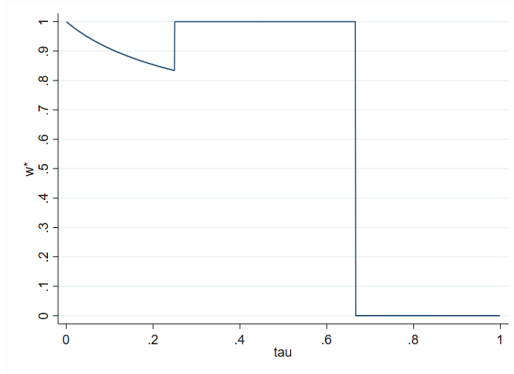


(b)

Figure 64: A : $\mathcal{U}[12, 18]$ B : $\mathcal{U}[10, 20]$

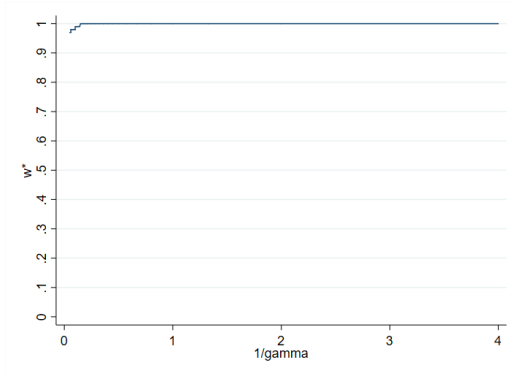


(a)

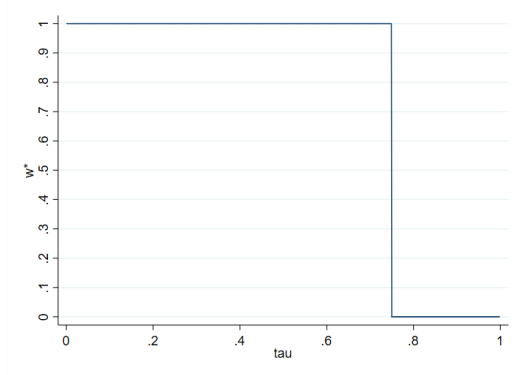


(b)

Figure 65: A : $\mathcal{U}[14, 18]$ B : $\mathcal{U}[10, 20]$

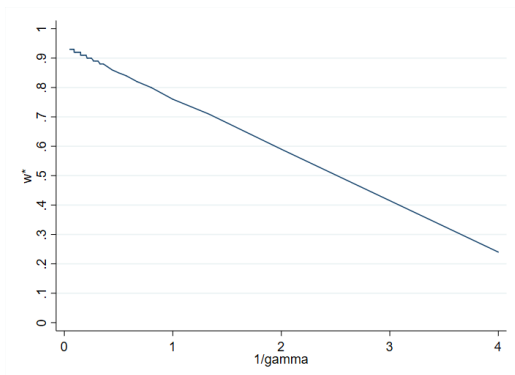


(a)

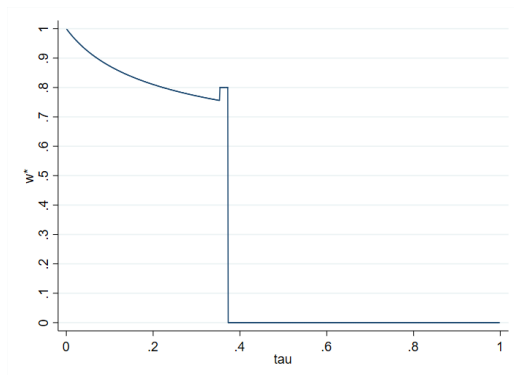


(b)

Figure 66: A : $\mathcal{U}[16, 18]$ B : $\mathcal{U}[10, 20]$



(a)



(b)

Figure 67: A : $\mathcal{U}[14, 16]$ B : $\mathcal{U}[12, 20]$

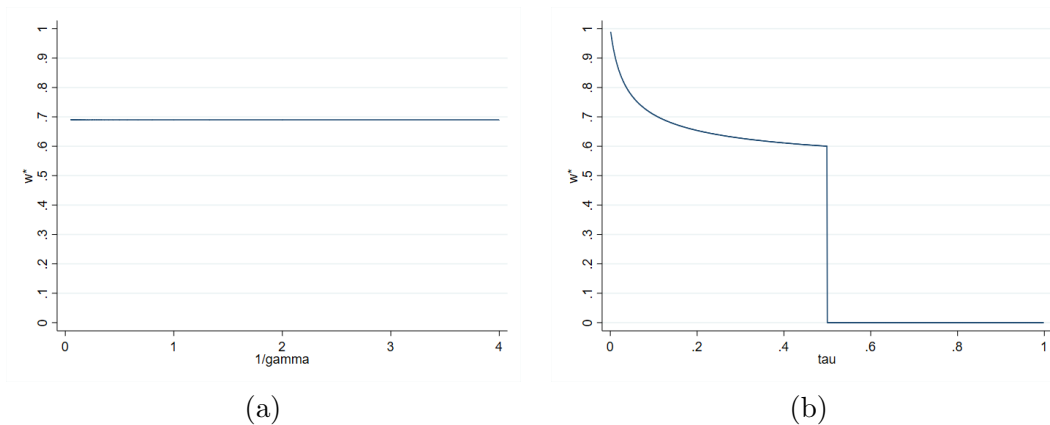


Figure 68: A : $U[13, 17]$ B : $U[12, 18]$

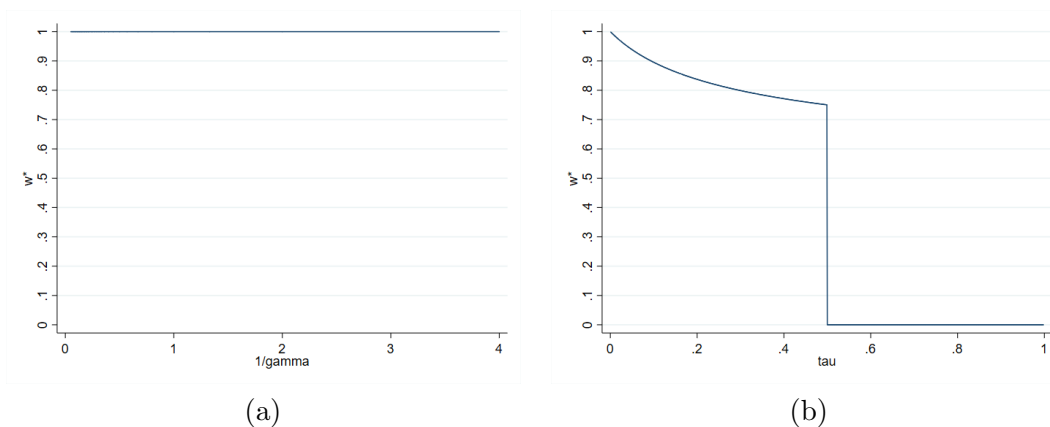
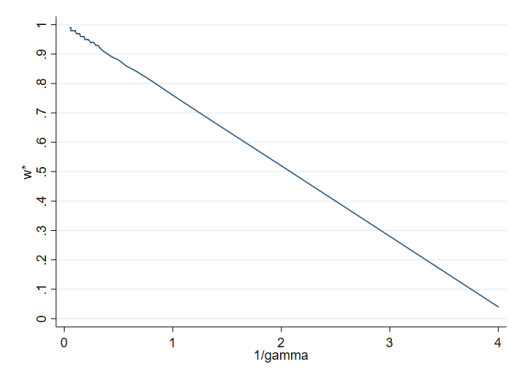


Figure 69: A : $U[14, 16]$ B : $U[12, 18]$

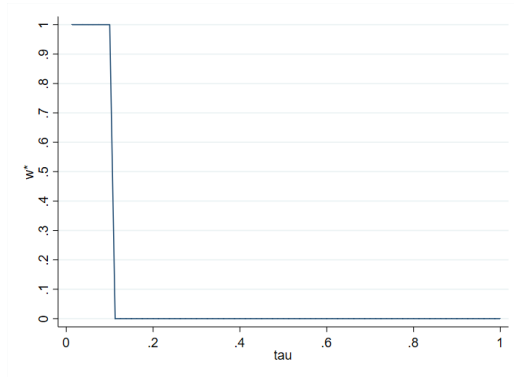
3.5 Example with risk-free asset:

In these examples, there is no stochastic dominance on either side. Lottery A corresponds to a risk-free asset with fixed payoff.

| | | |
|----------------------------|----------------------------|----------------------------|
| [70] A : 2 B : $U[0, 20]$ | [71] A : 4 B : $U[0, 20]$ | [72] A : 6 B : $U[0, 20]$ |
| [73] A : 8 B : $U[0, 20]$ | [74] A : 10 B : $U[0, 20]$ | [75] A : 12 B : $U[0, 20]$ |
| [76] A : 14 B : $U[0, 20]$ | [77] A : 16 B : $U[0, 20]$ | [78] A : 18 B : $U[0, 20]$ |
| [79] A : 20 B : $U[0, 20]$ | [80] A : 12 B : $U[8, 16]$ | [81] A : 9 B : $U[8, 20]$ |
| [82] A : 8 B : $U[4, 24]$ | [83] A : 10 B : $U[8, 12]$ | [84] A : 6 B : $U[2, 10]$ |
| [85] A : 14 B : $U[4, 24]$ | [86] A : 16 B : $U[4, 24]$ | [87] A : 18 B : $U[4, 24]$ |
| [88] A : 20 B : $U[4, 24]$ | [89] A : 22 B : $U[4, 24]$ | [90] A : 24 B : $U[4, 24]$ |

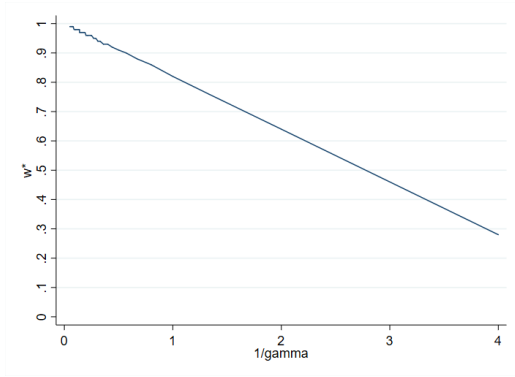


(a)

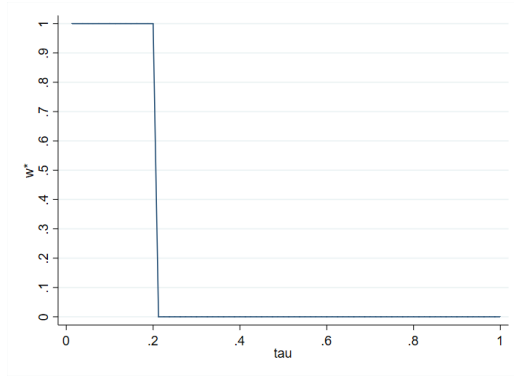


(b)

Figure 70: A : 2 B : U[0, 20]

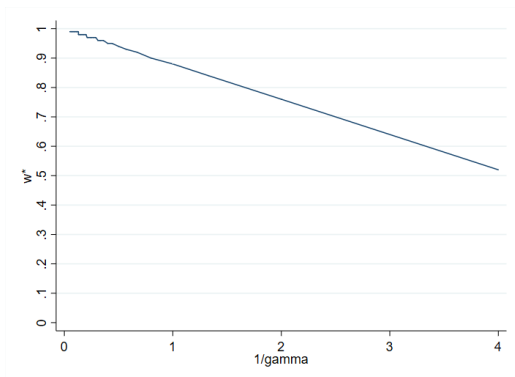


(a)

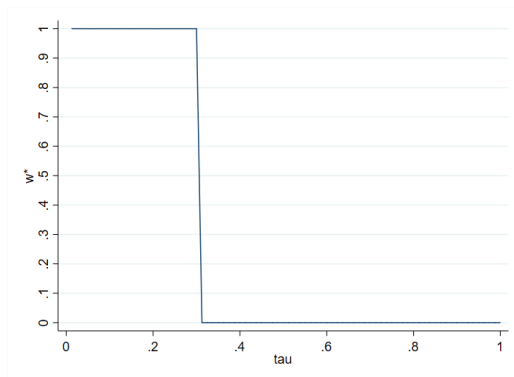


(b)

Figure 71: A : 4 B : U[0, 20]

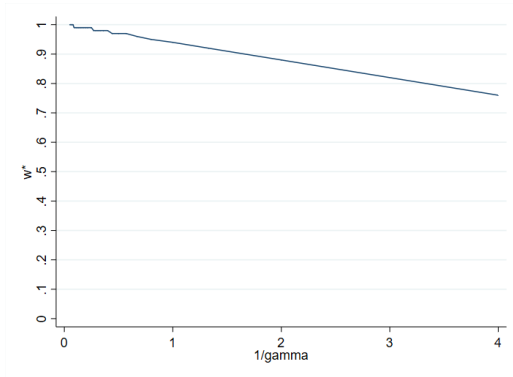


(a)

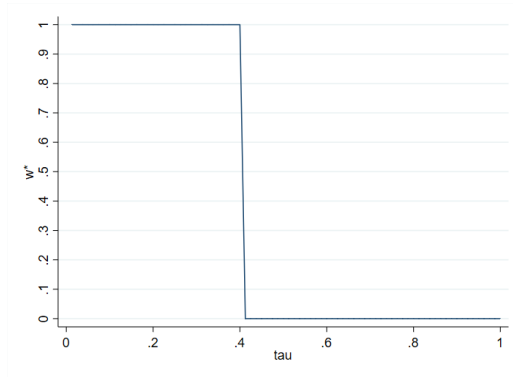


(b)

Figure 72: A : 6 B : U[0, 20]

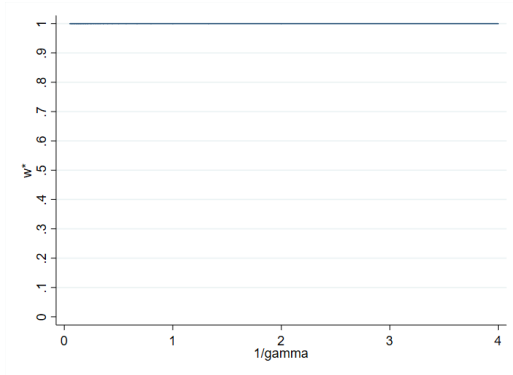


(a)

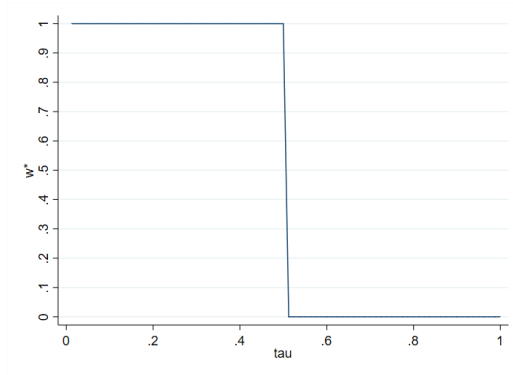


(b)

Figure 73: A : 8 B : U[0, 20]

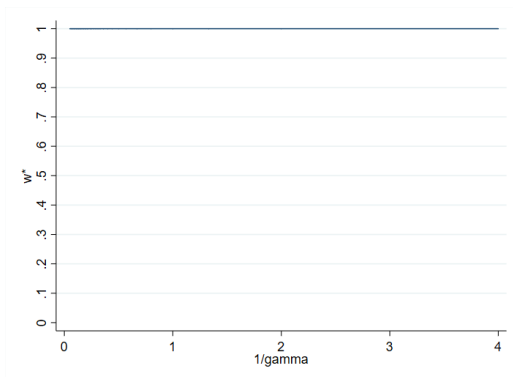


(a)

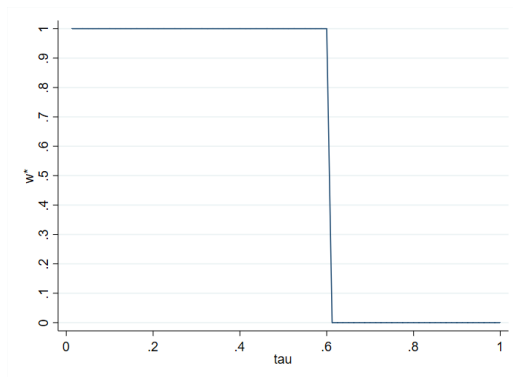


(b)

Figure 74: A : 10 B : U[0, 20]

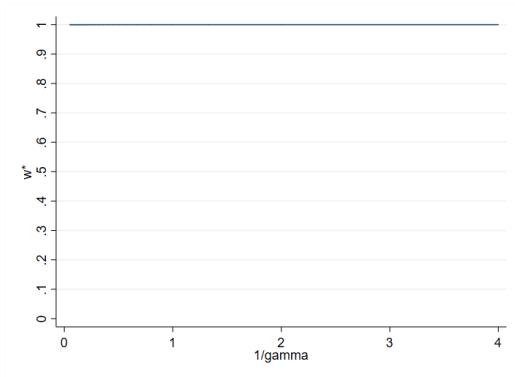


(a)

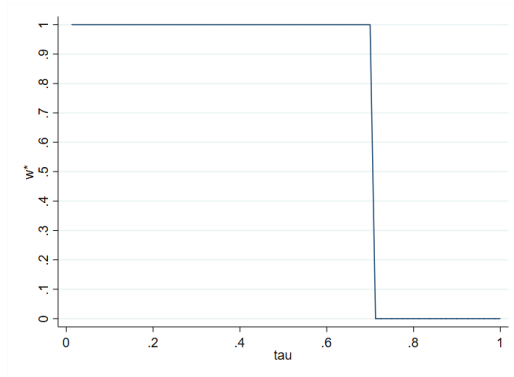


(b)

Figure 75: A : 12 B : U[0, 20]

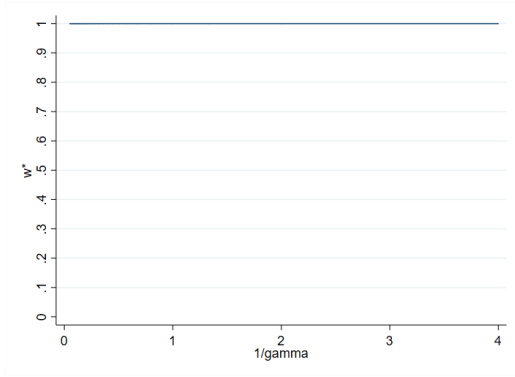


(a)

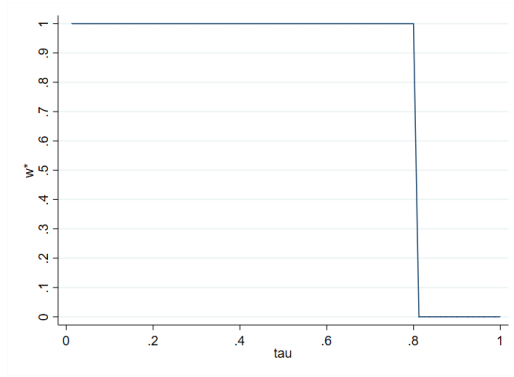


(b)

Figure 76: A : 14 B : U[0, 20]

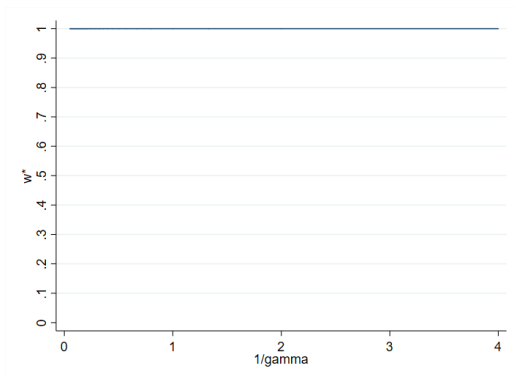


(a)

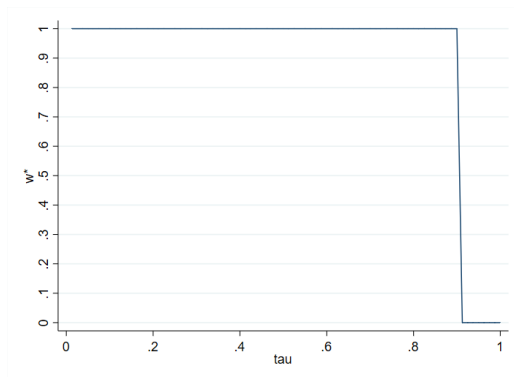


(b)

Figure 77: A : 16 B : U[0, 20]

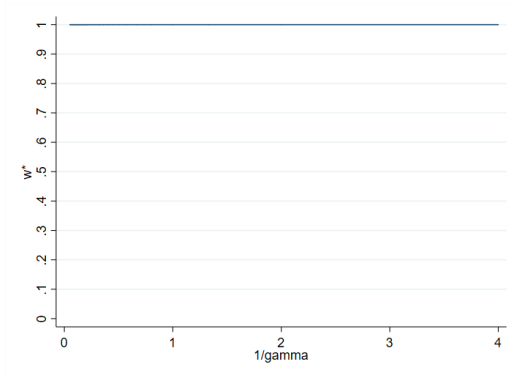


(a)

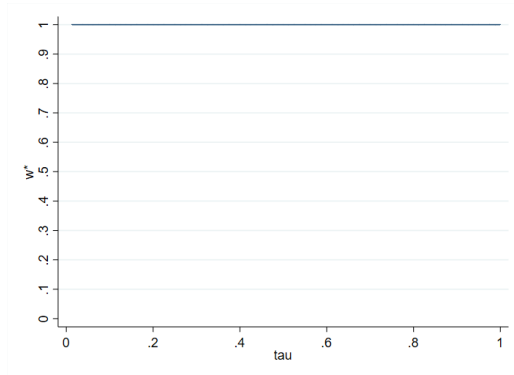


(b)

Figure 78: A : 18 B : U[0, 20]

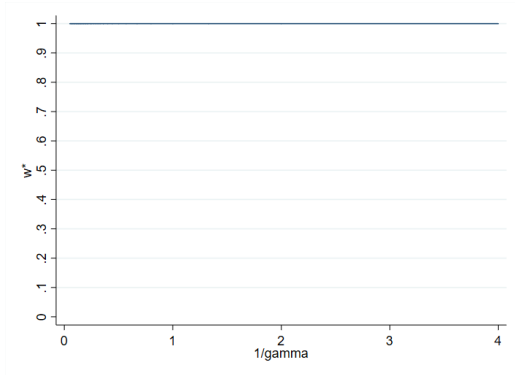


(a)

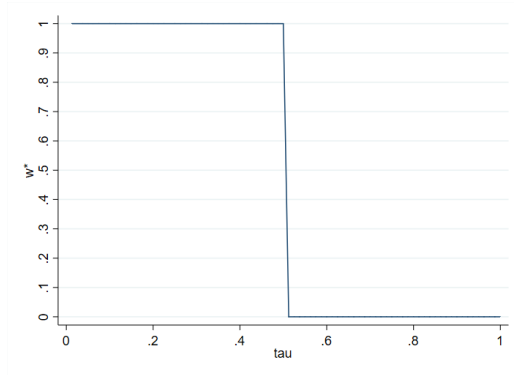


(b)

Figure 79: A : 20 B : U[0, 20]

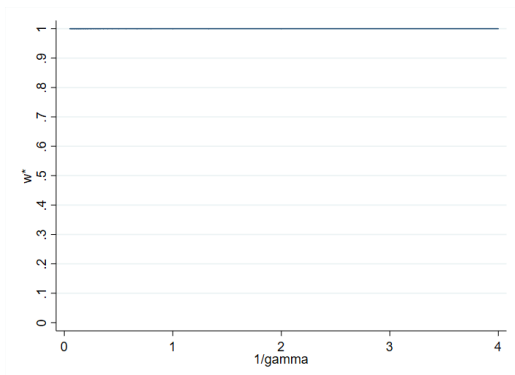


(a)

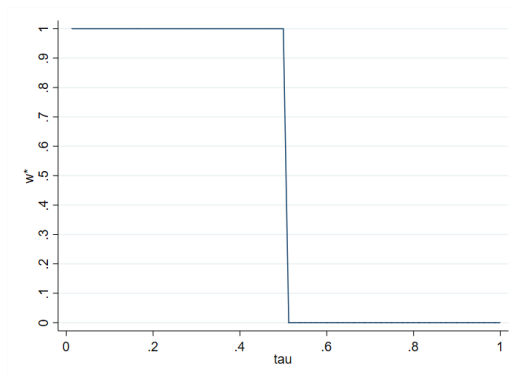


(b)

Figure 80: A : 12 B : U[8, 16]

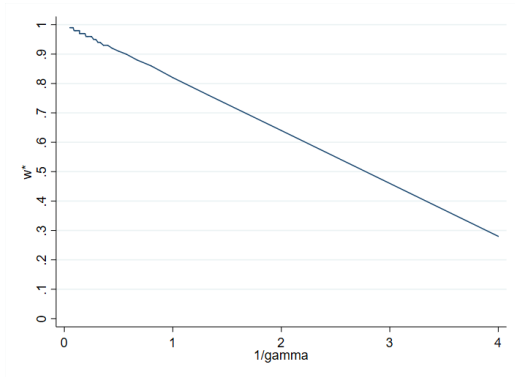


(a)

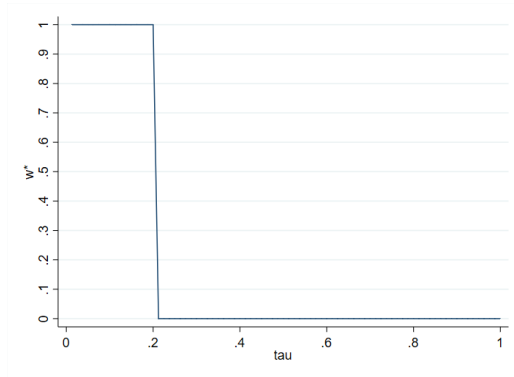


(b)

Figure 81: A : 9 B : U[8, 10]

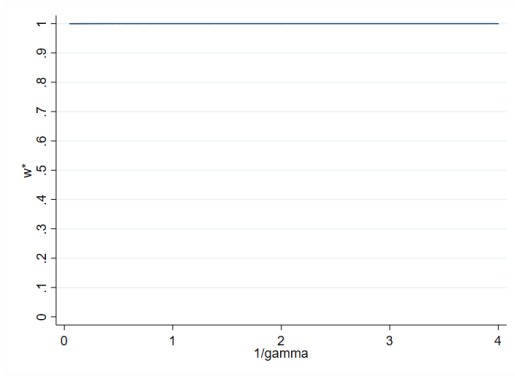


(a)

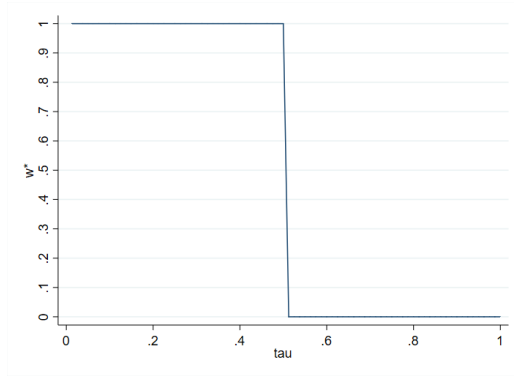


(b)

Figure 82: A : 8 B : U[4, 24]

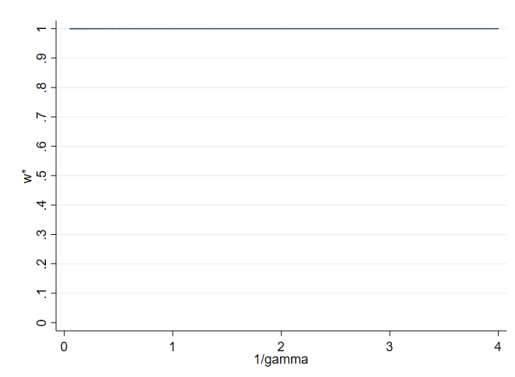


(a)

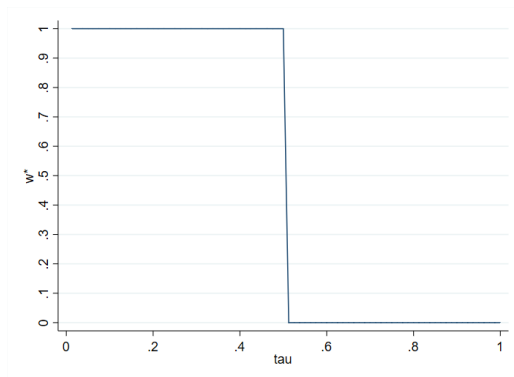


(b)

Figure 83: A : 10 B : U[8, 12]

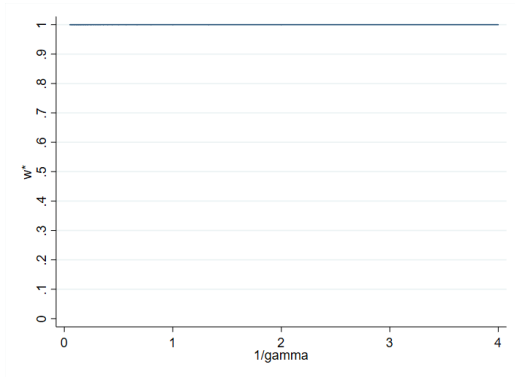


(a)

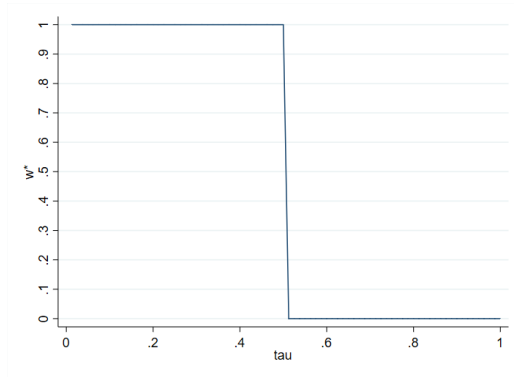


(b)

Figure 84: A : 6 B : U[2, 10]

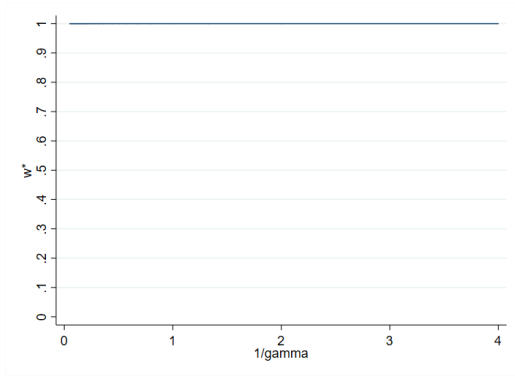


(a)

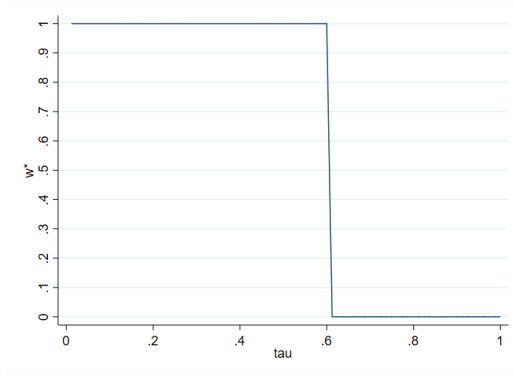


(b)

Figure 85: A : 14 B : U[4, 24]

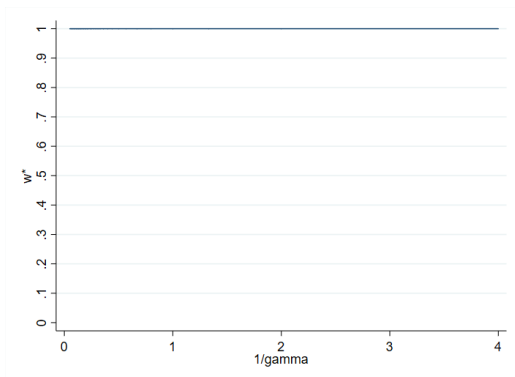


(a)

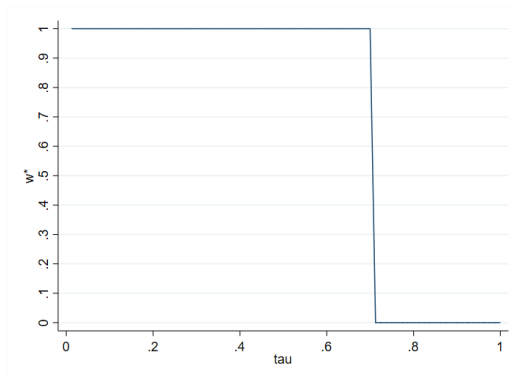


(b)

Figure 86: A : 16 B : U[4, 24]

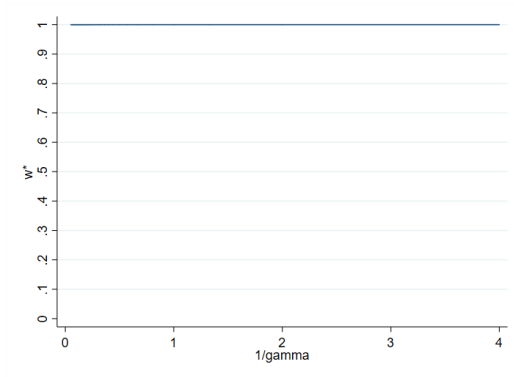


(a)

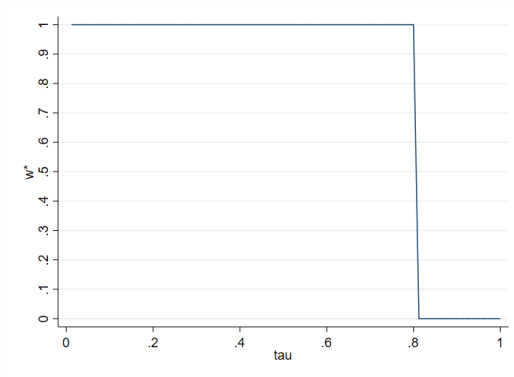


(b)

Figure 87: A : 18 B : U[4, 24]

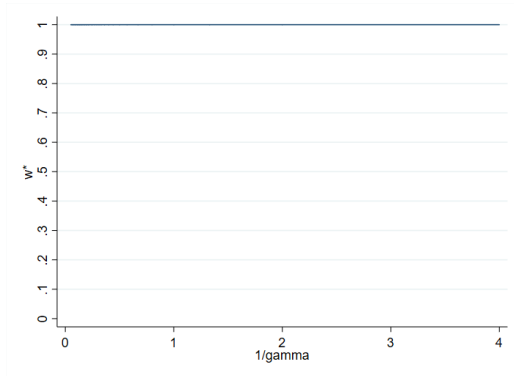


(a)

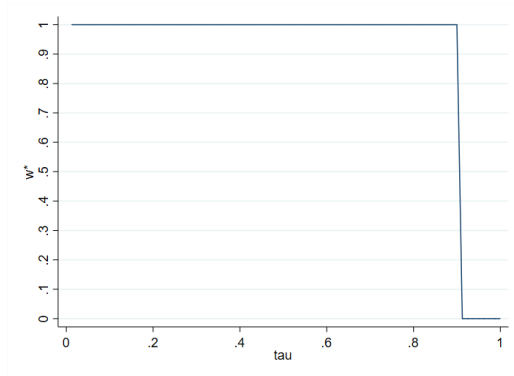


(b)

Figure 88: A : 20 B : U[4, 24]

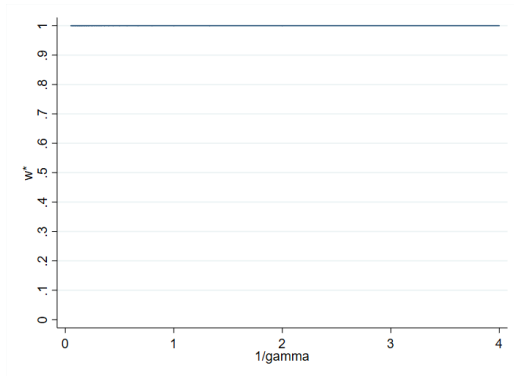


(a)

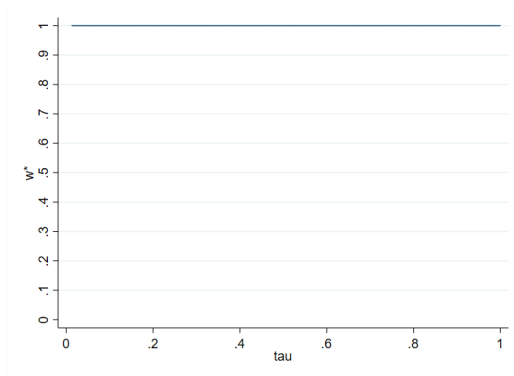


(b)

Figure 89: A : 22 B : U[4, 24]



(a)



(b)

Figure 90: A : 24 B : U[4, 24]