**Assignment 0 Quan Zhou**

The assignment is to be done individually. Show your work thoroughly.

1. Construct an economy with agents and endowments where the following asset price dynamics can be realized as an equilibrium outcome:
   1. There is a risk free asset with 5% return
   2. There is a risky asset with 9% return in the state 1 of time T and 3% in all the other state of time T
   3. True probability for state 1 is 10%
   4. HINT: There can be a number of different economies which show the same price dynamics

Assume the price of AD security that pays 1 in state 1 is x, the price of AD security that pays 1 in other states is y.

|  |  |  |  |
| --- | --- | --- | --- |
|  | T=0 | T=1 | |
| AD1 | x | State1 | 1 |
| State2 | 0 |
| AD2 | y | State1 | 0 |
| State2 | 1 |

As we know, the values of risk free and risky asset are as below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | T=0 | T=1 | |
| Risk free asset | 1.0 | State1 | 1.05 |
|  |  | State2 | 1.05 |
| Risky asset | 1.0 | State1 | 1.09 |
|  |  | State2 | 1.03 |

Using AD securities to replicate the return of risk free and risky asset, the following equations are obtained.

*1.05x + 1.05y = 1*

*1.09x + 1.03y = 1* So x = 0.31746, y = 0.63492.

Since Arrow-Debreu price = real prob \* MRS, MRS in state1 is 0.31746 / 0.1 = 3.1746 and MRS in state2 is 0.63492 / 0.9 = 0.7055

So one possible endowments of an agent in this economy is:

|  |  |  |  |
| --- | --- | --- | --- |
|  | T=0 | T=1 | |
| Agent | 100 | State1 | 317.46 |
| State2 | 70.55 |

1. Construct an economy with agents and endowments where the following asset price dynamics can be realized as an equilibrium outcome:
   1. There is a risk free asset with 5% return
   2. There is a risky asset with 9% return in the state 1 of time T and 3% in all the other state of time T
   3. There is a risky asset with 7% return in the state 2 of time T and 4% in all the other state of time T
   4. The true probability for state 1 is 10%
   5. The true probability for state 2 is 80%

Assume the price of AD security that pays 1 in state 1 is x, the price of AD security that pays 1 in state 2 is y and the price of AD security that pays1 in all other states is z.

|  |  |  |  |
| --- | --- | --- | --- |
|  | T=0 | T=1 | |
| AD1 | x | State1 | 1 |
| State2 | 0 |
| State3 | 0 |
| AD2 | y | State1 | 0 |
| State2 | 1 |
| State3 | 0 |
| AD3 | z | State1 | 0 |
| State2 | 0 |
| State3 | 1 |

As we know, the values of risk free and risky asset are as below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | T=0 | T=1 | |
| Risk free asset | 1.0 | State1 | 1.05 |
| State2 | 1.05 |
| State3 | 1.05 |
| Risky asset1 | 1.0 | State1 | 1.09 |
| State2 | 1.03 |
| State3 | 1.03 |
| Risky asset2 | 1.0 | State1 | 1.04 |
| State2 | 1.07 |
| State3 | 1.04 |

Using AD securities to replicate the return of risk free and risky assets, the following equations are obtained.

*1.05x + 1.05y + 1.05z = 1*

*1.09x + 1.03y +1.03z = 1*

*1.04x + 1.07y + 1.04z = 1* So x = y = z = 0.31746.

Since Arrow-Debreu price = real prob \* MRS, MRS in state1 is 0.31746 / 0.1 = 3.1746, MRS in state2 is 0.31746 / 0.8 = 0.3968 and MRS in state3 is 0.31746 / 0.1 = 3.1746.

So one possible endowments of an agent in this economy is:

|  |  |  |  |
| --- | --- | --- | --- |
|  | T=0 | T=1 | |
| Agent | 100 | State1 | 317.46 |
| State2 | 39.68 |
| State3 | 317.46 |