LECTURE 1.2

DECISION MAKING UNDER RISK

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A fundamental question in economics is how people respond to a choice involving a risky prospect.

- We usually think about agents maximizing expected utility.
- Most people are risk averse compared with being risk loving. They prefer less risk or uncertainty.
- More precisely:
  - a risk averse person will prefer a sure thing to a risky alternative with the same expected (average) value
  - a risk averse person has a concave utility function

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Suppose we have an event or lottery X with possible outcomes $\{x_1, x_2, \ldots, x_n\}$. The probability of outcome x_i is $p(x_i)=P(X=x_i)$

The *expected value* or mean of X is:

$$\mu = E(X) = \sum p(x_i)x_i = p(x_1)x_1 + p(x_2)x_2 + \ldots + p(x_n)x_n$$

The *variance* of X is:

$$\sigma^2 = \sum p(x_i) \cdot (x_i - \mu)^2$$

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For a person with a utility function of $U(x)$, the *expected utility* of the lottery is:

$$EU(X) = E(U(X)) = \sum p(x_i)U(x_i)$$

The certainty equivalent of the lottery, *CE(X)*, is the value of a certain payment that gives the same expected utility as the lottery *X*.

The risk premium is the difference between the expected value of a lottery and its certainty equivalent

$$\text{Risk premium} = \mu\text{-}CE(X) = E(X) - CE(X)$$

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Consider someone who faces a choice between two different payment schemes.

1) Salary = $80,000; σ=0. Expected value = $80,000.
2) Salary + performance bonus with σ=81,650. Expected value = $100,000.

What are they indifferent between them? What does this look like?

We will look at this in two different ways:

1) With indifference curves
2) With the utility function (although using a simpler salary structure)

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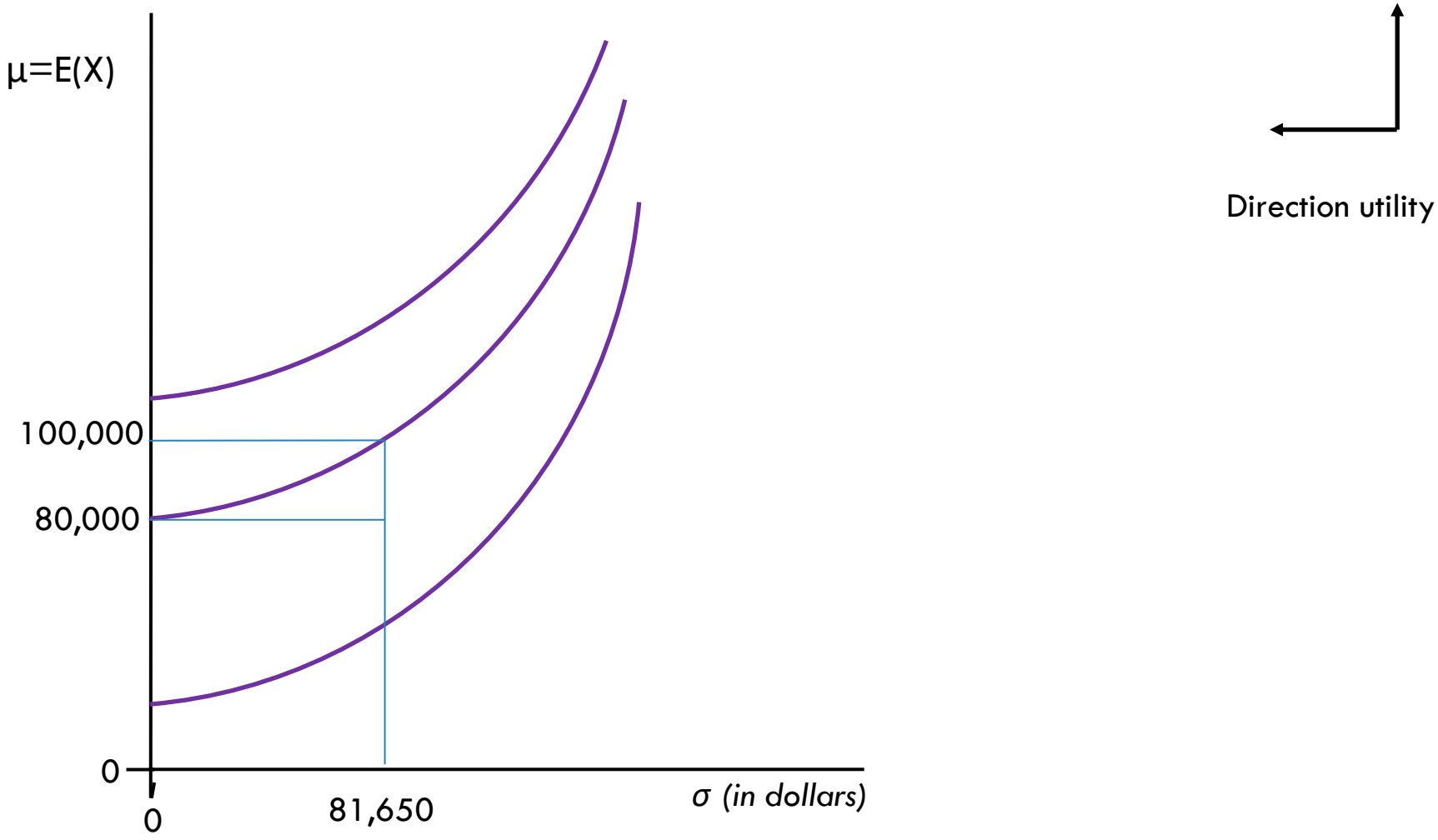

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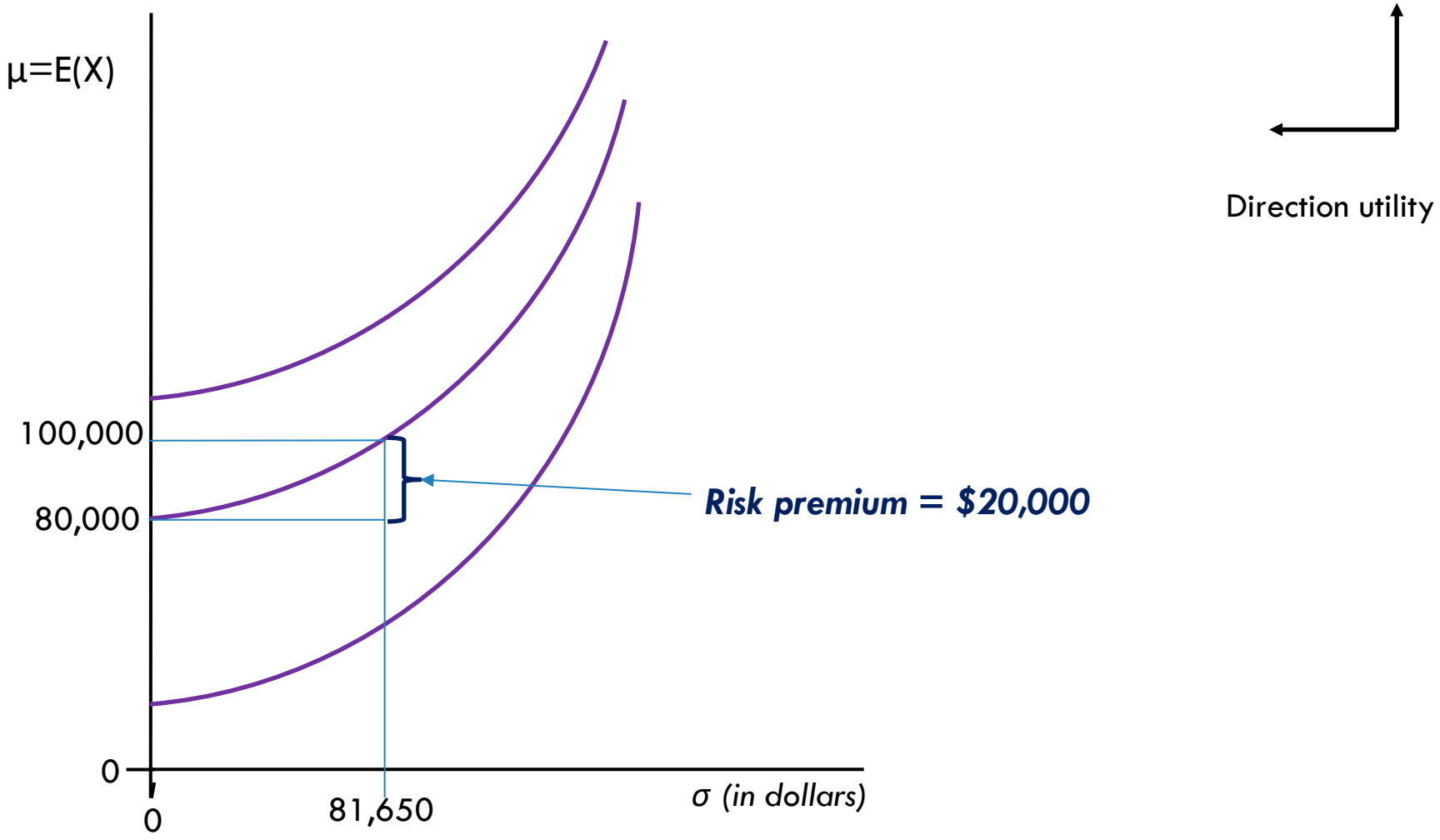

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Consider someone who faces is offered a job with the following payment scheme.

1) If they have a good year and sell many houses (50% of the time) their salary = $100,000.

2) If they have a bad year and sell nothing (the other 50%) their salary = $0.

The expected value is $50,000.

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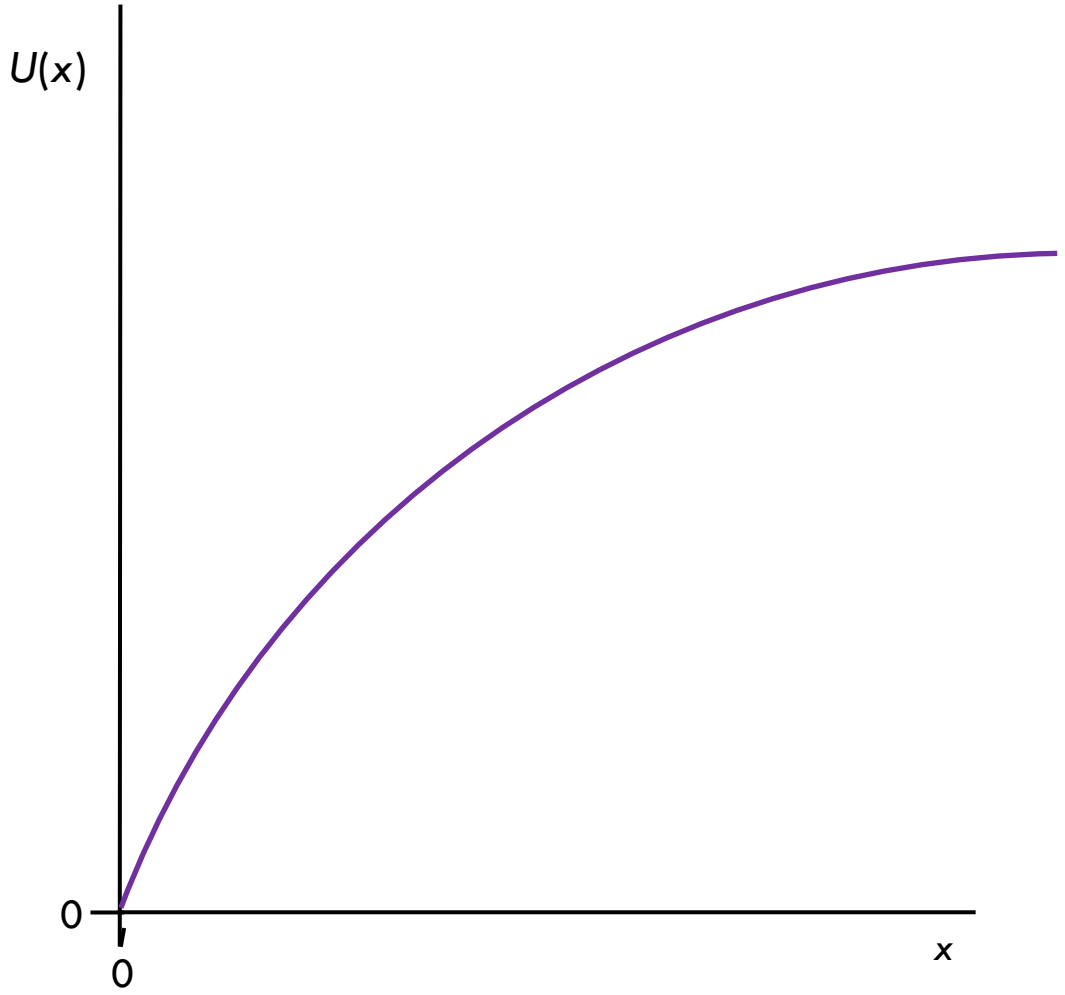

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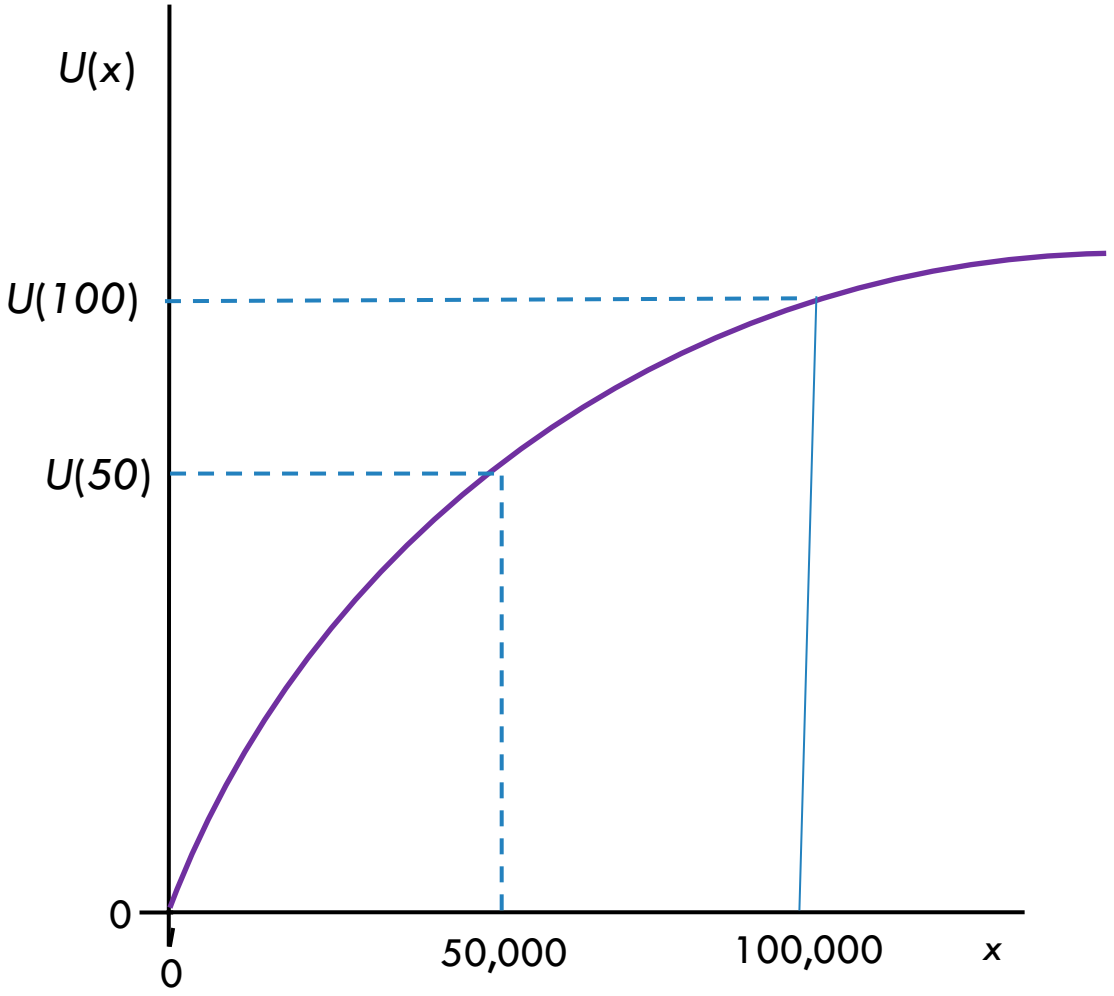

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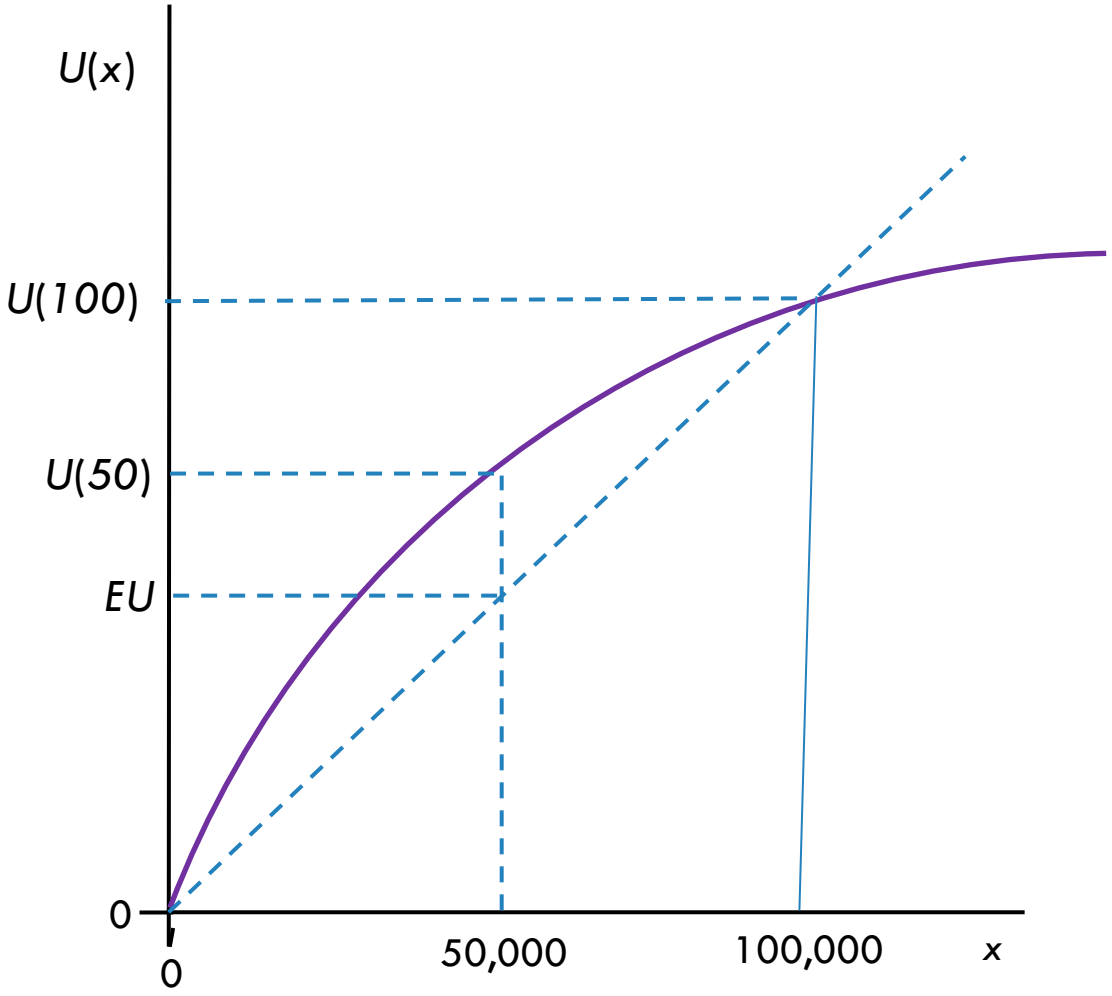

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