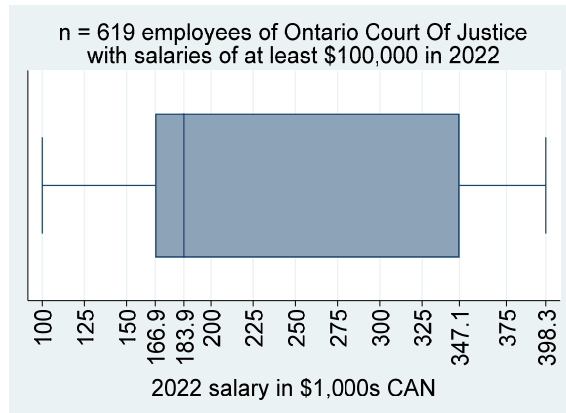


ECO220Y1Y, Test #1, Prof. Murdock SOLUTIONS

(1) (a)



(b) 619; 0.5%; \$347,139; 20%; exactly 100%

(2) (a)

$$\bar{X} = \frac{\sum_{i=1}^n x_i}{n} = 0.0192 * 0 + 0.0058 * 1 + 0.0151 * 2 + 0.0308 * 3 + 0.0462 * 4 + 0.1269 * 5 + 0.1288 * 6 + 0.2596 * 7 + 0.2173 * 8 + 0.10 * 9 + 0.0538 * 10 = 6.71$$

Or, alternatively:

$$\bar{X} = \frac{\sum_{i=1}^n x_i}{n} = \frac{10 * 0 + 1 * 3 + 2 * 6 + 3 * 16 + 4 * 24 + 5 * 66 + 6 * 67 + 7 * 135 + 113 * 8 + 9 * 52 + 10 * 28}{520} = \frac{3488}{520} = 6.71$$

(b) Given that there are only 11 unique and consecutive integer values, we would use a discrete histogram with 11 bins. Both common formulae suggest more than 11 bins ($\sqrt{520} = 22.8$ and $\frac{10 \ln(n)}{\ln(10)} = 27.2$), which does not make any sense in this case.

(3) 12; 5.6

(b) As of 2021-2022, a *majority* of Vanguard investors expect the annual returns over 10 years for more socially conscious stocks to be at least one percentage point lower than the overall stock market. However, the single most common investor expectation – over 20% of investors – is that the ESG returns will perform between zero and one percentage point better per year than the market. In other words, over one-fifth of investors expect returns to be very similar. Overall, we see a wide range of expectations, with many investors expecting ESG stocks to substantially *underperform* relative to the market, but also a non-trivial fraction expecting these to *outperform* the market.

(4) (a) Each row in these data, which corresponds to the unit of observation, is a country.

(b) For the 66 countries with annual measures of real GDP per capita growth rates for the decades from 1950 through 2010, those with an annual growth rate in the 1970s that is *one standard deviation* higher, on average have an annual growth rate in the 1980s that is *0.39 standard deviations* higher. This is a weak positive correlation, which is consistent with the conclusion of Pritchett and Summers (2014) that growth rates are not persistent.

(5) (a) observational; panel; panel; time series; cross sectional

(b) Among the 79 countries with happiness data for both 2007 and 2022, the mean national happiness in 2007 is 5.51 on the 0 to 10 Cantril ladder scale and is 0.18 points higher in 2022. This is a small improvement over this 16-year period: average national happiness across countries improved by only 3.3 percent.

(c) In India during the period from 2005 through 2022, in years when real GDP per capita is 1 percent higher we observe happiness that is 0.02 units lower on the zero to ten Cantril ladder scale. This is a small decline and contrary to the positive relationship we may have expected: thinking that a relatively poor country becoming richer would help national happiness levels.

(d) About 63.3 percent of the variation across countries in national happiness in 2022 can be explained by variation in real GDP per capita. [You may also say variation in the natural log of real GDP per capita.]

(6) (a) This figure is not a histogram because it summarizes the relationship between *two* variables – independence (a dummy) and program of study (a categorical variable). In contrast, a histogram tells the distribution of *one* quantitative variable.

(b) For students in ECO220Y in Fall of 2023 who answered the survey, those enrolled in an economics major or specialist program are nearly 10 percentage points more likely to select independence as an important value to instill in children compared to students in the Rotman Commerce Accounting program, where about 58% selected independence as one of their top five values. This is a pretty large difference and may reflect differences in the types of students that are drawn to these different programs.

(7) (a) From May 2018 through March 2023, on days when the Bitcoin market price is \$100 higher, on average the Scrubgrass Power Plant emits one additional metric ton of CO₂ in emissions.

(b) On days when the Bitcoin price is one percent higher, Scrubgrass emits approximately 0.21 percent more CO₂ on average.