

## D/ DETAILED OUTLINE

### I. Part 1: Overview and data description

#### 1. Overview of topic (4-5 fist sentences)

- Search Google Scholar, EconLit, JSTOR for recent papers on "determinants of human development index", "drivers of HDI", "HDI empirical analysis" etc.
- Scan articles to identify key variables examined that influence HDI.
- Briefly summarize the main variables and expected relationships found in each paper.

#### Examples:

Lee (2022) found higher health expenditures and education levels positively affected HDI across developing countries.

- Compile a list of determinants frequently found to impact HDI based on reviewing 3-5 articles.
- Consider how these align with variables available in your dataset.
- Select 4-6 potential predictors to focus on in your analysis based on data availability and consistency in the literature.

#### Examples:

Based on research identifying GDP, health, education, and governance as drivers of HDI, I will focus on GDP per capita, life expectancy, schooling, and government effectiveness in my model.

#### 2. Data description

- Import dataset and filter for assigned countries/year
- Generate table of descriptive statistics for key variables:
- Discuss central tendency and dispersion of each variable distribution

#### Examples:

Mean HDI is 0.7 with a standard deviation of 0.1, indicating a fairly high level of development on average.

### II. Part 2: Initial Estimation

#### A. Write linear regression models

- Model 1 (single regression):

$$\text{HDI} = \beta_0 + \beta_1 \text{GE} + \varepsilon$$

- Model 2 (multiple regression):  

$$\text{HDI} = \beta_0 + \beta_1 \text{GDP\_growth} + \beta_2 \text{FDI} + \beta_3 \text{Gini} + \beta_4 \text{GE} + \varepsilon$$
- State expected signs of coefficients and explain why

### **Examples:**

Based on economic intuition and past empirical research, I expect the following relationships between the independent variables and HDI:

- GDP growth: Positive effect. Faster economic growth indicates rising prosperity, which should improve human development.
- FDI: Positive effect. Foreign investment can promote technology diffusion and productivity, benefiting HDI.
- Gini coefficient: Negative effect. Higher inequality may limit opportunities and resources for many in society, dragging down overall human development.
- Government effectiveness: Positive effect. Competent governance and public services are crucial for facilitating health, education, and overall development.

### **B. Estimate models using OLS**

- Run OLS regressions in RStudio
- Present coefficient estimates, standard errors, R-squared, F-statistic, observations etc in a table
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## **III. Part 3: Interpretation**

### **A. Interpret R-squared**

- Assess overall model fit based on R-squared (higher is better)
- Comment on differences between R-squared and adjusted R-squared

### **Examples:**

- The R-squared of 0.61 indicates Model 1 explains 61% of the variation in HDI. The adjusted R-squared of 0.60 accounts for the model size.
- Model 2 has a higher R-squared of 0.85 and adjusted R-squared of 0.84, indicating it fits the data better than Model 1.

### **B. F-test interpretation**

- State null and alternative hypotheses
- Compare F-statistic to critical value at chosen significance level (e.g. 5%)
- Reject null if F-statistic exceeds critical value

### **Examples:**

- Null hypothesis: All coefficients equal to zero
- Alternative: At least one coefficient differs from zero
- The F-statistic of 125 exceeds the critical value at 5% significance level.

- Therefore, we reject the null and conclude at least some predictors are significantly related to HDI

### **C. T-test interpretation**

- For each significant variable, state null and alternative hypotheses
- Compare t-statistic to critical t-value at chosen significance level (e.g. 1%)
- Interpret direction and quantify effect of significant variables

#### **Examples:**

- For GDP growth, the t-statistic of 4.2 exceeds the 1% critical value.
- We reject the null hypothesis that its coefficient equals zero.
- A 1 percentage point increase in GDP growth is associated with a 0.18 increase in HDI, holding other factors constant.

### **D. Compare to expectations**

- State whether estimated signs match expected based on theory and literature
- Briefly explain agreements or discrepancies

#### **Examples:**

- The estimated positive coefficients on GDP growth and government effectiveness match theoretical expectations.
- However, the Gini coefficient estimate is positive rather than the expected negative sign.

### **E. Compare models**

- Recommend Model 2 based on higher R-squared, more explanatory variables etc.
- Justify why it is preferred over Model 1

#### **Examples:**

- Model 2 is preferred due to its higher R-squared, adjusted R-squared, and inclusion of more potentially relevant explanatory variables.
- Model 1 may suffer from omitted variable bias by only including government effectiveness.

## **IV. Part 4: Further estimation**

### **A. Create dummy variable and re-estimate**

- Generate HighFDI based on mean FDI per capita
- Re-run Model 2 substituting HighFDI for FDI
- Interpret coefficient on HighFDI and relate to HDI

#### **Examples:**

- Generated HighFDI = 1 if FDI/Pop > mean, 0 otherwise
- Re-estimated Model 2 replacing FDI with HighFDI
- HighFDI coefficient is 0.12 and significant at 5% level
- Having high FDI per capita increases HDI by 0.12 points on average

### **B. Add interaction term**

- Create interaction variable between GE and HighFDI

- Re-estimate Model 3 with interaction term
- Interpret interaction coefficient if significant

#### **Examples:**

- Created interaction variable between GE and HighFDI
- Re-estimated Model 3 including interaction term
- Interaction coefficient is 0.08 and significant at 10% level
- Greater government effectiveness amplifies the HDI benefit of high FDI per capita

#### **C. Estimate alternate model**

- Suggest functional form improvements or additional variables
- Estimate revised model (Model 5)
- Interpret and compare to original model

#### **Examples:**

- Added years of schooling and health expenditure variables
- Used log transforms to improve model fit
- New model has higher adjusted R-squared of 0.86
- Schooling and health expenditures positively associated with HDI

### **V. Part 5: Conclusion**

1. **Summarize findings in simple terms for non-technical audiences** (4-5 sentences)

#### **Examples**

- Economic growth, foreign investment, education and health spending drive development
- But inequality and weak governance undermine human progress

2. **Propose policies linked to empirical results to improve HDI** (8-10 sentences)

- Provide at least 2 policies with details (how it should be conducted)

#### **Examples**

- Invest in education and healthcare access
- Facilitate high-quality foreign investment
- Promote equitable growth and effective institutions

## **E/ TIPS & TRICKS**

#### **Writing Tips:**

- Carefully follow the required structure and explicitly address each component of the questions.
- Concisely explain your methodology, results, and interpretation. Avoid rambling text.
- Define key terms and concepts when mentioned for the first time.
- Link analysis back to economic context and significance.
- Use headings and formatting strategies like bullet points to enhance readability.
- Cite data sources. Use proper references.

#### **Data Visualization:**

- Check that histograms effectively convey distribution shape and outliers.
- Use appropriate axis scales and labels on graphs.
- Title all tables and figures. Number them sequentially.
- Highlight key takeaways from visualizations in a brief discussion.
- Export graphs cleanly from RStudio. Do not use pixelated screenshots.

Analysis:

- Justify assumptions clearly, like using normal distribution for confidence intervals.
- Show all calculations. Use proper statistical notation and formulae.
- Interpret the meaning of test statistics, p-values, and confidence intervals.
- Double check code for errors. Test alternate model specifications.
- Relate analysis back to research objectives and economic context.