EIB-GDN PROGRAM IN APPLIDED DEVELOPMENT FINANCE

Written Assignment for Selection of *Candidate Fellows* for 2018-2019 Program Cycle

Set 2: Friday, 18 May 2018

PART I: ANALYTICAL & DATA SKILLS

1. **Basic Analytical Concepts[1]**

a)   A country has the following income distribution.

	Lowest 10%	Lowest 20%	Second 20%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
Year 1	1.0	2.9	6.0	10.6	19.3	61.3	44.4
Year 2	1.6	5.0	10.2	15.3	22.5	46.9	30.6

What are the Gini coefficients in Year 1 and Year 2?

b)   Consider a simple model trying to estimate the impact of private clinics on maternal mortality rate.

Maternal_Mortality = A + B * Private_Clinics + C

where, Private_Clinics = 1 if a municipality has at least 1 private clinic, = 0 otherwise
and C is i.i.d. error term with $E(C) = 0$.

Suppose that in your data set, Maternal_Mortality is 8% in municipalities that have private clinics and 15% in municipalities that do not.

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[1] These should be considered as short answer questions. Please use a couple of sentences to a maximum of one paragraph, including calculations, to respond to them.

What are the OLS estimates of A and B? Can you think of any reasons that the estimates may be biased?

c) The following table shows average annual income of people before and after the launch of a microfinance program.

	Average Income ($)	
	Participants	Non-Participants
Pre-intervention period	900	800
Post-intervention period	1150	1100

What is the impact of microfinance program on participants' income?

d) In a country, the cancer has prevalence of 1 out of 1000 people. The diagnostic test has a false positive rate of 15% (meaning 15% of people who don't have it are incorrectly tested as having cancer). But the test correctly diagnoses every person who has cancer. What is the probability that a randomly selected person with a positive test result actually has cancer?

e) Consider the following demand curve for the restaurants in a city,

$\ln(Q) = A + B \ln(P) + C \ln(Y) + U$,

where Q is number of customer visit and P is the price of average meal, Y is mean income and U is the standard error term.

How will you test the hypothesis that during economic recessions, people prefer cooking at home than eating out? Please specify any assumptions you have to make.

f) A website report mentions that average price for a gallon of gasoline in a country is $3.94. Assume the standard deviation of $0.25 for the price of gasoline per gallon. What should be the sample size if the company wishes to report with margin of error of $0.05 at 95% confidence?

g) A grocery store chain launched special Christmas promotion during the month of December at some of its stores. Suppose that we have a panel data set on individual stores collected monthly. How would you estimate the impact of the promotion campaign? Which regression model would you run?

2. **Data Skills**

This exercise requires you to work with data on Sustainable Development Goals, which is available from
https://datacatalog.worldbank.org/dataset/sustainable-development-goals

[Click on "Data & Resources" tab on above page. Then click on "Excel" which downloads the data as a zip file containing the excel file.]

The variable of interest is "Prevalence of undernourishment (% of population)" or the indicator code "SN.ITK.DEFC.ZS". We want to study this variable is caused by "GDP, PPP (constant 2011 international $)" and whether "GDP growth (annual %)" can explain the changes in this variable over time.

Answer the following questions, based on the downloaded data.

a)   Which country has experienced the highest reduction in the prevalence of under-nourishment? Which country has experienced the highest average yearly reduction in the prevalence of under-nourishment? Among the countries with prevalence of under-nourishment data, which country has experienced the highest growth in GDP, PPP (constant 2011 international $)? Among the countries with prevalence of undernourishment data, which country has experienced the highest average annual GDP growth?

Due to the missing data, it is understandable that the time horizon will be different for the countries i.e. instead of 1991-2017 it will be from first year with data to last year with data.

b)   Can GDP, PPP (constant 2011 international $) explain the differences in prevalence of under-nourishment (show scatter plot)? If yes, is the relationship significant (show regression estimates)?

c)   Can GDP growth (annual %) be causing the reduction in prevalence of under-nourishment (show scatter plot)? If yes, is the relationship significant (show regression estimates)?

PART II: KNOWLEDGE OF EVALUATION

3. [Acumen Fund](#) (AF) is a venture capital (VC) fund that claims to "changing the way the world tackles poverty". By striking a middle way between markets and philosophy, it aims to provide "VC for the poor" for promoting long-term change. AF invests in "early-stage companies whose products and services enable the poor to transform their lives", and also provides investee companies with "tools, networks, technical assistance and strategic guidance needed to succeed and scale-up into long-term solutions to poverty."

AF has recently, in 2016, invested in [Farmers Hope](#) – a producer and distributor of organic fertilizer (see: https://acumen.org/investment/farmers-hope/). In preparation for a possible 2nd round of funding in 2019, AF has contracted you to produce a Deep Dive Report (DDR) on the operations of Farmers Hope. Your first step is to write a summary proposal of not more than 5 pages (single-spaced, size A4, font 11) that should include the following:

1. A short description of the mission and business model of Farmers Hope;
2. A SWOT analysis, with examples from comparator companies, if available;
3. A Theory of Change (ToC) of the claimed impact mechanism;
4. Your methodological approach to track or identify the impact (if it exists);
5. What kind of data you may need to collect and how you plan to collect such data; and
6. Possible theoretical and practical challenges to producing the DDR.

You are free to look up other sources and references. You are also encouraged to seek advice from your friends or expert mentors (please mention in your response if you do).

PART III: PROFESSIONAL COMMUNICATION SKILLS

1. You have been asked, under the EIB-GDN program, to carry out a deep dive study of an investee company under ABC Fund, which EIB supports through equity financing. Carlo, the Program Manager at EIB assigned to you, has cc-ed you on the email below he sent to the Fund's Managing Director (MD), Mr Edward Featherstonhaugh. Draft a follow up email to introduce yourself and to tell Mr. Featherstonhaugh what you propose to do. This email would be the first step in setting up your collaboration with ABC Fund on this research. Please note that the MD and his staff have very little background on research, so they might find research jargon very difficult – and possible boring as well. Moreover, they all work in a fast-paced start up environment, so they won't spend more than 5 minutes reading your email.

To: edward.featherstonhaugh@accfund.co.org

Subject: Intro

Hi Bertie,

Great to see you in Nairobi, and thank you very much for the nice discussions!

We're through recruiting the next cohort of researchers for the Sept 2018 EIB/GDN program we mentioned. In this email, we have cced [YOUR NAME] (based in [YOUR COUNTRY]), who has been assigned to work with ABC Fund. It would be great if you could put [YOUR NAME] in touch with one of your investee companies you think could benefit from this research.

We will leave it to [YOUR NAME] to tell you more about the EIB-GDN program, how this can benefit your investee company, and to take this cooperation forward.

Best regards,

Carlo