An Econometric Study: The Cost of Mobile Broadband

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Overview

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   - Data
2. Econometric analysis
   - First Model
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3. Conclusion

Our Topic

Mobile Broadband

- Mobile broadband services can be accessed through a computer-based connection, using a USB-modem/dongle to connect to the mobile network, or through a handset-based connection.
- By 2016, more than 80 percent of broadband connections will be mobile.(Source: Wireless Intelligence Database)

Our Topic

- The impact of different factors on mobile broadband price.

Parameters

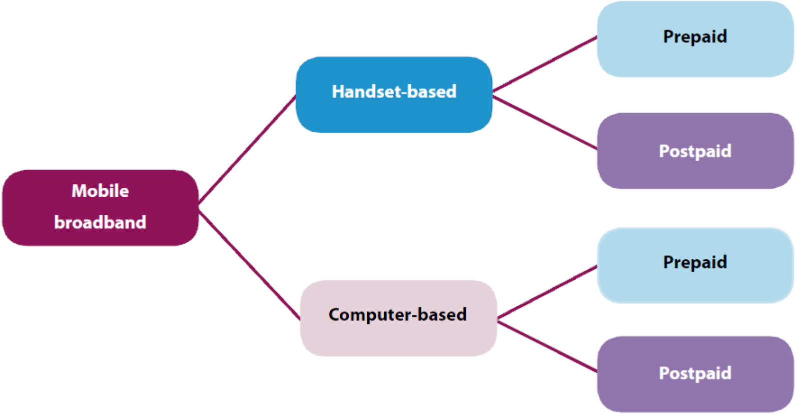
Dependent Variable

- The mobile broadband price on a country level

Explanatory Variables

- GDP per capita
- Competition between service providers (ISP)
- Level of urbanization (Urban population ratio)
- Education level (Years of schooling)
- Population
- Number of mobile broadband subscribers
- Area of each country

Data


Mobile broadband
Handset-based
Computer-based
Prepaid
Postpaid
Prepaid
Postpaid

Rules for collecting price data

- We choose 500MB postpaid handset-based plans (most affordable)

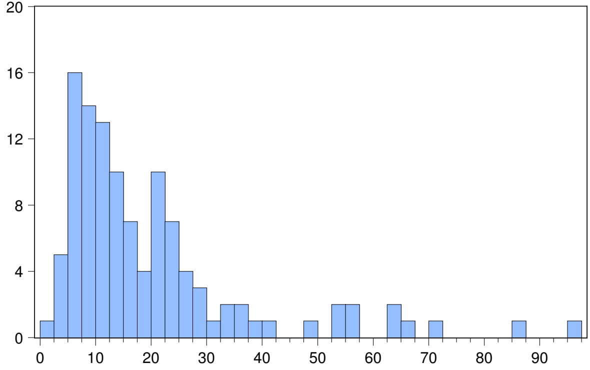
Rules

- Mobile data price from the operator with largest market share in the country
- Prices include TAX
- On a monthly basis
- Price in original currency, then converted into USD

Sources

- International Telecommunication Union
- UNESCO
- World Bank
- Wikipedia

Postpaid handset-based prices (500 MB), 2012



Series: PRICE
Sample 1 112
Observations 112

Mean	20.00982
Median	14.25000
Maximum	96.00000
Minimum	1.800000
Std. Dev.	17.65126
Skewness	2.023797
Kurtosis	7.318659
Jarque-Bera	163.4913
Probability	0.000000

First Model

$$
\begin{aligned}
Price_i = &\beta_0 + \beta_1 GDP_i + \beta_2 ISP_i + \beta_3 urbr_i + \\
&\beta_4 edu_i + \beta_5 pop_i + \beta_6 msub_i + \beta_7 area_i
\end{aligned}
$$

$$i = 1, 2, ..., 118$$

Descriptions

- Normalization: $x_{new} = \frac{x - x_{min}}{x_{max} - x_{min}}$
- GDP: GDP per capita, ISP: service providers, Urbr: urban population ratio, edu: years of schooling, pop: population, msub: mobile broadband subscribers, area: area of each country

First Model–Regression results

Variable	Coefficient	Std. Error	t-Stastistics	Prob.
C	0.126771	0.046686	2.715400	0.0078
GDP	0.356848	0.100310	3.557461	0.0006
ISP	0.580770	0.184103	3.154598	0.0021
URBR	-0.029712	0.166233	-0.178738	0.8585
EDU	0.012092	0.088155	0.137165	0.8912
POP	0.000436	0.137260	0.003178	0.9975
MSUB	-0.044396	0.095052	-0.467069	0.6414
AREA	0.019737	0.133237	0.148133	0.8825

R-squared	0.274433	Mean dependent var	0.193310
Adjusted R-squared	0.225597	S.D. dependent var	0.187381
S.E. of regression	0.164895	Akaike info criterion	-0.698263
Sum squared resid	2.827808	Schwarz criterion	-0.504084
Log likelihood	47.10272	Hannan-Quinn criter.	-0.619478
F-statistic	5.619462	Durbin-Watson stat	1.785316
Prob(F-statistic)	0.000016		

Hypothesis Test

F-test

- Null: $H_0 : c(1) = c(2) = ... = c(k) = 0$
- $Prob. = 0.000016 < 0.05$
- Reject the null hypothesis

t-test, null hypothesis: $C(6) = 0$

Test Statistic	Value	df	Probability
t-statistic	0.003178	104	0.9975

- $0.9975 > 0.05$, we accept the null hypothesis
- Same test is done for other coefficients

Second Model

- $Price_i = \beta_0 + \beta_1 GDP_i + \beta_2 ISP_i$

Variable	Coefficient	Std. Error	t-Stastistics	Prob.
C	0.126843	0.019646	6.456549	0.0000
GDP	0.328647	0.071771	4.579083	0.0000
ISP	0.586936	0.163408	3.591852	0.0005

R-squared	0.272265	Mean dependent var	0.193310
Adjusted R-squared	0.258912	S.D. dependent var	0.187381
S.E. of regression	0.161309	Akaike info criterion	-0.784565
Sum squared resid	2.836257	Schwarz criterion	-0.711748
Log likelihood	46.93564	Hannan-Quinn criter.	-0.755021
F-statistic	20.38994	Durbin-Watson stat	1.763455
Prob(F-statistic)	0.000000		

Second Model

Interpretations

- The two probabilities are almost zero
- Prob(F-statistic) < 0.05
- $R^2 = 0.272265$, too small.

Regression equation

- $Price_i = 0.12684 + 0.32865 GDP_i + 0.58694 ISP_i$
- $i = 1, 2, 3, ..., 118$

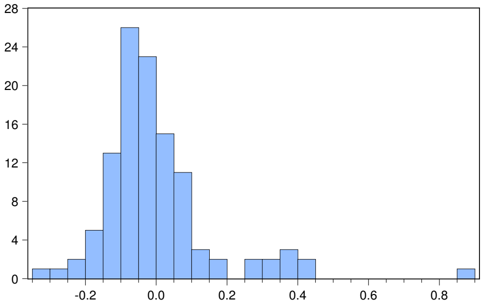
Heteroscedasticity Test: White

F-statistic	0.654048	Prob. F(5,106)	0.6590
Obs*R-squared	3.351936	Prob. Chi-Square(5)	0.6459
Scaled explained SS	14.43108	Prob. Chi-Square(5)	0.0131

Interpretation

- *Prob.* $= 0.6590 > 0.05$, we accept the homoscedasticity hypothesis
- The residuals have the same finite variance

Normality test of residuals

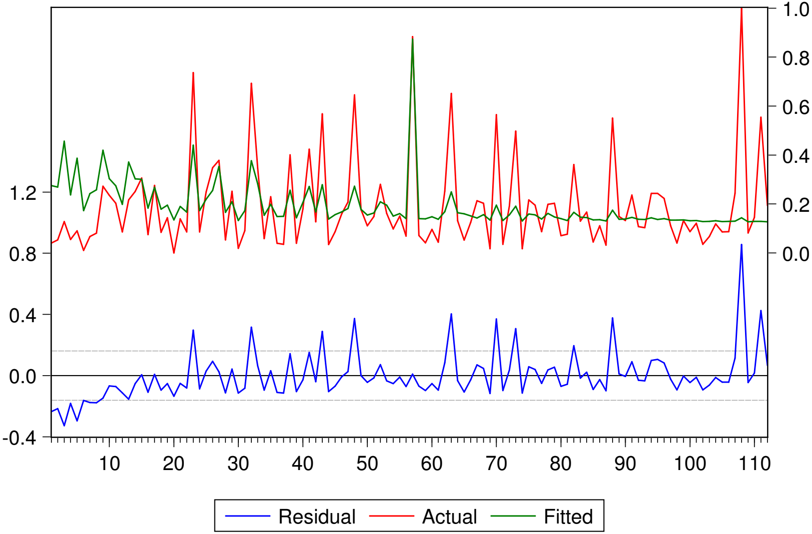


Series: RESID
Sample 1 112
Observations 112

Mean	-2.48e-18
Median	-0.033340
Maximum	0.856568
Minimum	-0.327627
Std. Dev.	0.159850
Skewness	2.031776
Kurtosis	10.09109
Jarque-Bera	311.7147
Probability	0.000000

- Mean, $E(\epsilon) = 0$
- *Prob.* $= 0$, reject normality

Actual, Fitted, Residual Graph



Elasticity

$$Price_i = 0.12684 + 0.32865 GDP_i + 0.58694 ISP_i$$

Estimated price elasticity of GDP per capita

- $\frac{\partial Price}{\partial GDP} = 0.32865$
- A 10 percent increase in GDP p.c. results in a 3 percent increase in price

Estimated price elasticity of ISP

- $\frac{\partial Price}{\partial ISP} = 0.58694$
- A 10 percent increase in number of service providers results in a 6 percent increase in price

Conclusion

Our model

- GDP p.c. and ISP are good indicators of mobile broadband price
- Not good fitness of data, R^2 too small
- Only two explanatory variables
- Residuals are not normally distributed
- A lot of factors are statically insignificant

Further work

- Mobile broadband price seems not to be influenced by the area of each country, but we believe that for developing countries, it would have significant influence
- Conduct econometric study inside developing countries and developed countries to make a comparison

The End