Infant Mortality and Macroeconomic Changes in LATAM

Daniel Mujica[a]

Abstract:

This paper would analyze the effects that economic indicators have over mortality rates in Latin America. Hence, the purpose would be to represent the drives of changes in mortality. This will be achieved by undergoing a thorough analysis of correlated variables that will create a significant outcome over this important problem that emerging countries in Latin America need to solve in order to achieve long term economic and social prosperity.

JEL Classification: I15

Keywords: Health, Economic Development, Mortality.

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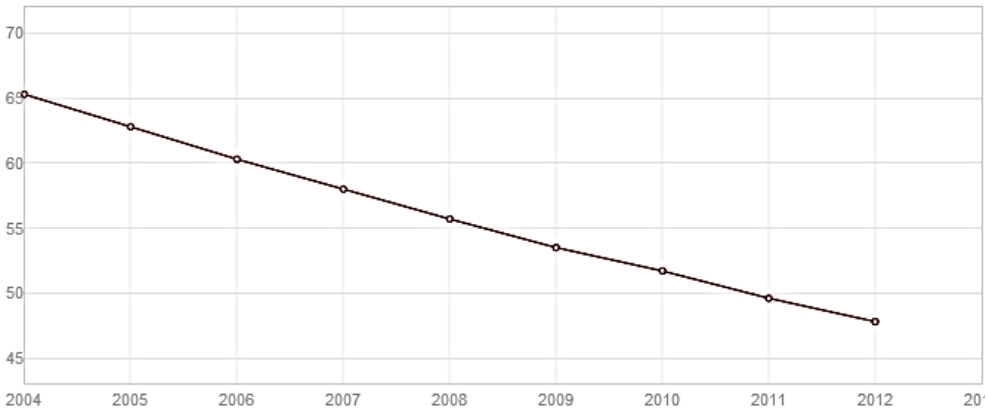
1.0 INTRODUCTION

Many emerging markets in Latin America are expected to have significant economic growth in the next decade. It is a region that has great potential for business opportunities in the long term. Many multinational firms are expected to enter this market in the next years. As a result, I believe it is interesting to understand relevant variables that influence economic and social stability in the region. One of the main issues that Latin American countries need to address encompasses health care problems. Therefore, I have chosen to analyze mortality rates as the dependent variable to realize stability. More specifically, the subject of this paper would be the effects that economic indicators have over mortality rates in Latin America. Hence, the purpose would be to represent the drives of changes in mortality. This will be achieved by undergoing a thorough analysis of correlated variables that will create a significant outcome over this important problem that emerging countries in Latin America need to solve in order to achieve long term economic and social prosperity.

2.0 TREND (OF THE GIVEN TOPIC)

Figure 1 shows life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. The public sector is the main provider of health care in developing countries in Latin America. One can observe a reduction in mortality rate as countries have emphasized primary health care, including sanitation, safe motherhood initiatives, and access to clean drinking water.

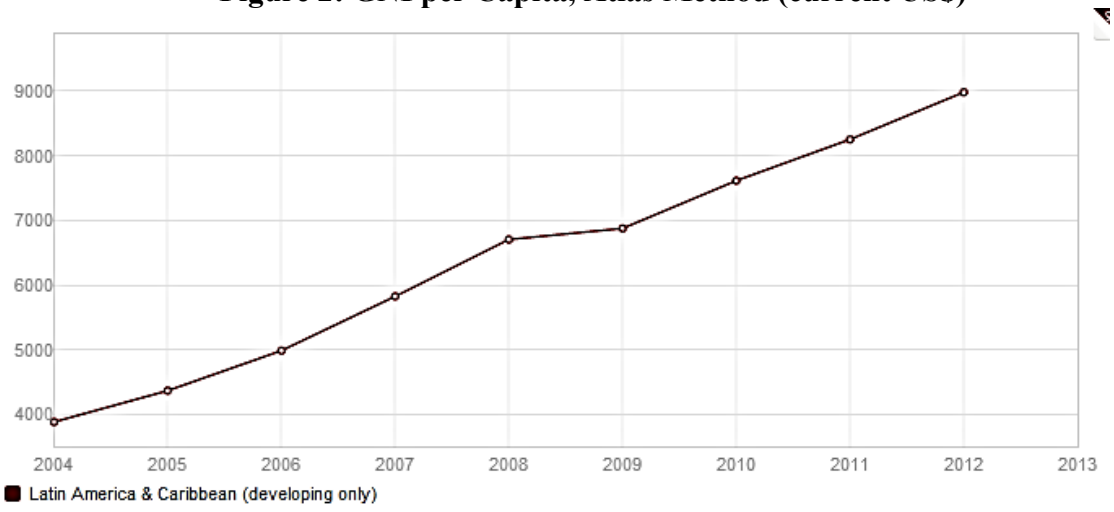
Figure 1: Mortality rate, under-5 (per 1,000 live births)



Source: World Bank Development Indicators

Figure 2 shows the real gross national income in U.S. dollars. This figure helps represent economic growth in Latin America. One can find a correlation of economic prosperity as GNI per capita increases- thus, people benefit. This data can help policy-makers better understand current economic situations and guide toward improvement.

Figure 2: GNI per Capita, Atlas Method (current US$)



Source: World Bank Development Indicators

3.0 LITERATURE REVIEW

Mortality rates can be seen as crucial indicators of health status in a nation. More specifically, they measure life expectancy at birth or survival at a given age. These economic indicators provide significant relevance to many social sciences, as they are used to analyze socioeconomic development across nations. The findings that mortality rates are procyclical, introduced by Ogburn and Thomas (1922), suggests that mortality rates will tend to increase during economic booms. However, Brener (1979) believed this assumption to be inaccurate and presented a hypothesis of counter-cyclical mortality- a research that was criticized by many economists and then disbelieved.

Moreover, Ruhm (2000) analyzed how business cycles affect mortality in developed countries. As a result, he found that upturns in economic activities are associated with increases in total mortality. Ionidez et al. (2012) state cyclical mortality is observed for macroeconomic fluctuations at all time scales. At the same time, they specify that is important to consider other factors besides macroeconomic indicators to understand the real motives of changes in mortality rates. Additionally, the authors focus of the fact that population level associations should be separated from health consequences of economic fluctuations on groups that are considered outliers from the sample- most of the time; these are individuals who become unemployed.

Gonzalez (2008) set the basis for analyzing infant mortality in less developed nations- focusing in Mexico. He modified the model to improve the accuracy in emerging markets. The purpose of his paper was to investigate if Rhum (2000) findings were consistent in other middle and middle-high income countries. Gonzalez (2008) points out a main difference in his model

compared to Rhum (2000). Instead of using unemployment rate as an independent variable in his model, he decides to use GDP per capita as a preferred measurement of economic activity in Latin America.

Negrete (2001) explains several reasons why unemployment rate in developing countries in Latin America is perceived as a poor approach to real business cycles. First, his research shows that a substantial portion of the Mexican population is always self-employed- either in urban or rural areas. Thus, self-employed will suffer lower earnings from harsh economic times, but will still be considered employed. Second, most Latin American nations have flexible labor markets. This been said, most of adjustments to economic fluctuations will come from changes in wages (prices) rather than employment (quantities). Another reason why unemployment is not an accurate measure to use as an economic indicator is due to the fact that many governments in the region do not provide unemployment benefits. As a consequence, most of the unemployed will get a temporary job or will become self-employed and are not going to be considered unemployed anymore. Finally, a significant amount of Latin Americans that are unemployed migrate to other nations to seek better life quality standards.

After accounting for these changes for the Mexican market, Gonzalez (2008) provided some useful economic relationship between the business cycle and mortality rates in emerging countries in Latin America. From his results, he concludes that GDP per capita is will generate a social change that will ultimately affect mortality. Furthermore, his research showed that the coefficients for public health spending and the number of doctors are not statistically significant in regards to changes in mortality.

4.0 DATA AND EMPIRICAL METHODOLOGY

4.1 Data

The data used for this research was presented in an annual frequency from 2002 to 2012. It was collected from the World Bank Economic Indicators- one of the World Bank's leading online databases. Moreover, the data is Panel Cross sectional. Thus, the dataset was created from repeated cross sections over time. The sections used for this research were ten chosen nations of South America. I am confident that these segments accurately represent the similarities and differences of the entire U.S. population. As it the data was cross sectional, it helped to account for heterogeneity. Summary statistics for the data are provided in Table 1.

Table 1 Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
mort	110	21.44273	8.717024	12.7	52
popa	110	32.16364	4.877447	24	44
popb	110	61.86364	3.927035	52	68
gdpcap	110	5012.582	3114.32	893.95	13559.33
inc	110	3.178364	.8443623	1.5	4.93
health	110	334.5683	235.6617	51.07	1120.56

4.2 Empirical Model

$Mortality_{rate} = B0 + B1\,PopA + B2\,PopB + B3\,GDPcap + B4\,Inc + B5Health + U$ The economic model used for this research was the following:

Mort is annual Infant mortality in each country of the cross section alternatives. *Mort* is used as the dependent variable for the empirical model. The explanatory variables were meticulously chosen from past economic research in order to prevent bias. Furthermore, *PopA*

represents the percentage of the total population that fall into the 0-14 years range. *PopB* indicates the portion of the total population that fall into the 15-64 years range. *GDPcap* is the Gross Domestic Product per capita expressed in current US dollars. This is one of the most relevant variables in the model as it is expected to describe the changes of infant mortality rates in Latin America in a significantly accurate approach. Likewise, *Inc* depicts income share held by the lowest twenty percent of the population- a focal target market when analyzing infant mortality. *Health* measures public health expenditure per capita in current US dollars- this was another explanatory variable that had substantial expectations over the changes in infant mortality in the US. The reasoning was behind the assumption that higher health expenditures will lead to improvements in population health.

4.3 Empirical Results

Once I had collected all the required data, I started running regression models. As the dataset for the regression analysis was panel data, the first step was to inform Stata about the dimensions of space and time (the panel and time variables). Afterwards, I needed to understand if the data was homokedastic or heterokedastic. One can prove this by running a Breusch Pagan test. Where the null hypothesis is homokedastic and the alternative hypothesis is heterokedastic. The results were the following:

Breusch-Pagan LM statistic: 104.7198 Chi-sq(6) P-value = 2.6e-20

Based on the results of this test, I understood that my model was heterokedastic. Consequently, the next phase was to create a hypothesis testing to treat for individual effects in the data. Thus, the null hypothesis represented a random effect model- under the assumption that the error term

changed for each cross-sectional group. While the alternative hypothesis represented a fixed effect model- under the assumption that the intercept will change for each cross sectional group. After both models were implemented in Stata, I executed the Haussmann Test to understand which of the two models, mentioned in my hypothesis testing, was appropriate. The results were the following:

Please indicate to Table 2 for the empirical estimation results.

Table 2: Regression results for Infant Mortality

```
. xtreg Mort PopA PopB GDPcap Inc Health, fe

Fixed-effects (within) regression               Number of obs      =       110
Group variable: code                            Number of groups   =        10

R-sq:  within  = 0.7594                         Obs per group: min =        11
       between = 0.5494                                        avg =      11.0
       overall = 0.5623                                        max =        11

                                                F(5,95)            =     59.97
corr(u_i, Xb)  = -0.5807                        Prob > F           =    0.0000
```

Mort	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
PopA	1.210641	.3846439	3.15	0.002	.4470264	1.974256
PopB	-1.182778	.4635624	-2.55	0.012	-2.103066	-.2624907
GDPcap	.0004595	.0002722	1.69	0.095	-.0000809	.001
Inc	-.2420451	.507402	-0.48	0.634	-1.249365	.7652752
Health	-.0058213	.0033656	-1.73	0.087	-.0125029	.0008603
_cons	56.08851	39.73459	1.41	0.161	-22.79462	134.9716
sigma_u	7.1462117					
sigma_e	1.6997048					
rho	.94645777	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(9, 95) =    74.37                 Prob > F = 0.0000
```

After analyzing the results, I understood that fixed-effects was the appropriate model for analyzing my dataset. Using this type of model meant that the data was experiencing a constant variance of the error term.

From the fixed effects model, I interpreted each coefficient and understood the relationship that each explanatory variable had over infant mortality in Latin America with a 90 percent level of confidence (Ceteris Paribus). One can observe that *PopA* has a positive relationship with infant mortality. Therefore, with a ten percent significance level, the coefficient for this explanatory variable shows that a unit change in *PopA* will create a 1.21 unit increase in infant mortality-holding all relevant factors constant. Also, the regression results show that *PopB* has a negative relationship with the dependent variable of the model. The coefficient shows that with a ten percent significance level, a unit increase in *PopB* will create a decrease of 1.18 units in infant mortality-holding all other factors constant. However, one should not take this variable into consideration as it is considered to be statistically insignificant.

On the other hand, *GDPcap* shows a positive relationship with infant mortality. Therefore, a unit increase in GDP per capita will produce an increase of 0.00045 units in infant mortality-Ceteris Paribus. Likewise, the coefficient for *Inc* presents a negative relationship with the dependent variable. Nonetheless, one should not take this variable into account as it is not statistically significant with the chosen significance level of ten percent. *Health* shows a negative relationship with Infant Mortality. The model states that a unit increase in health care per capita will create a decrease of 0.006 units in infant mortality.

5.0 CONCLUSION

Overall, this economic research showed that Gross Domestic Product per Capita and Health care expenditure has a relevant effect over infant mortality in Latin America. Therefore, one can assume that stable and growing economies in this region will have lower infant mortality rates in the long run. At the same time, the percentage of the total population that fall into the 0-14 years range have a relevant effect over infant mortality in Latin America. As a result, one may understand that an increase in population growth will drive to higher infant mortality rates- Ceteris Paribus. Another important finding of the model used for this research was the fact that income per capita was a statistically insignificant explanatory variable. Hence, this result was not valid to prove the assumption that levels of income will actually improve infant mortality rates. On the other hand, as I used panel data with fixed-effects, the model experienced substantial benefits in terms of consistency and accounting for heterogeneity. Nevertheless, the fixed-effects model also created several consequences. It is probable that the unobserved effects and explanatory variables were correlated to some extent- even though it was assumed to be zero. As a result, the model may have experienced inefficiency.

Appendix A: Variable Description and Data Source

Acronym	Description	Data source
Mort	Annual Infant mortality by country per 1,000 live births	The World Bank
PopA	The percentage of the total population that fall into the 0-14 years range	The World Bank
PopB	The percentage of the total population that fall into the 15-64 years range	The World Bank
GDPcap	Gross Domestic Product per capita expressed in current US dollars	The World Bank
Inc	Income share held by the lowest twenty percent of the population	The World Bank
Health	Public health expenditure per capita in current US dollars	The World Bank

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Venezuela

The Crisis Continues

Created by:

Daniel Mujica

Location

Capital City: Caracas

Country Overview

Population
29.95 million

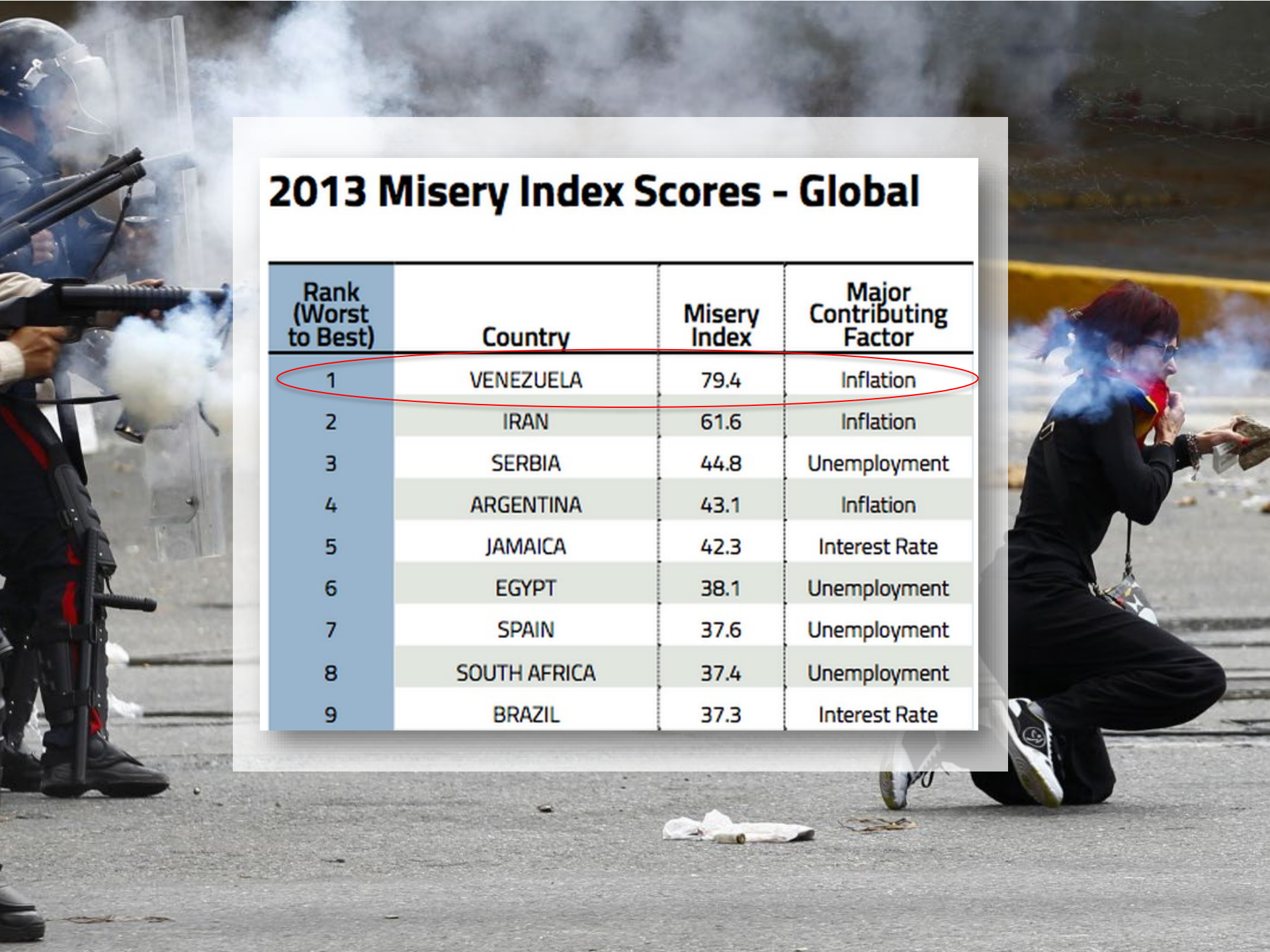
Corruption
Highly Corrupted
Ranked 160/177
Transparency Index

Inflation
56%
Highest in the continent

24,763
People were killed last year

GDP
$381.3 billion

*Source: World Bank Database



2013 Misery Index Scores - Global

Rank (Worst to Best)	Country	Misery Index	Major Contributing Factor
1	VENEZUELA	79.4	Inflation
2	IRAN	61.6	Inflation
3	SERBIA	44.8	Unemployment
4	ARGENTINA	43.1	Inflation
5	JAMAICA	42.3	Interest Rate
6	EGYPT	38.1	Unemployment
7	SPAIN	37.6	Unemployment
8	SOUTH AFRICA	37.4	Unemployment
9	BRAZIL	37.3	Interest Rate

Inflation & Exchange Rates

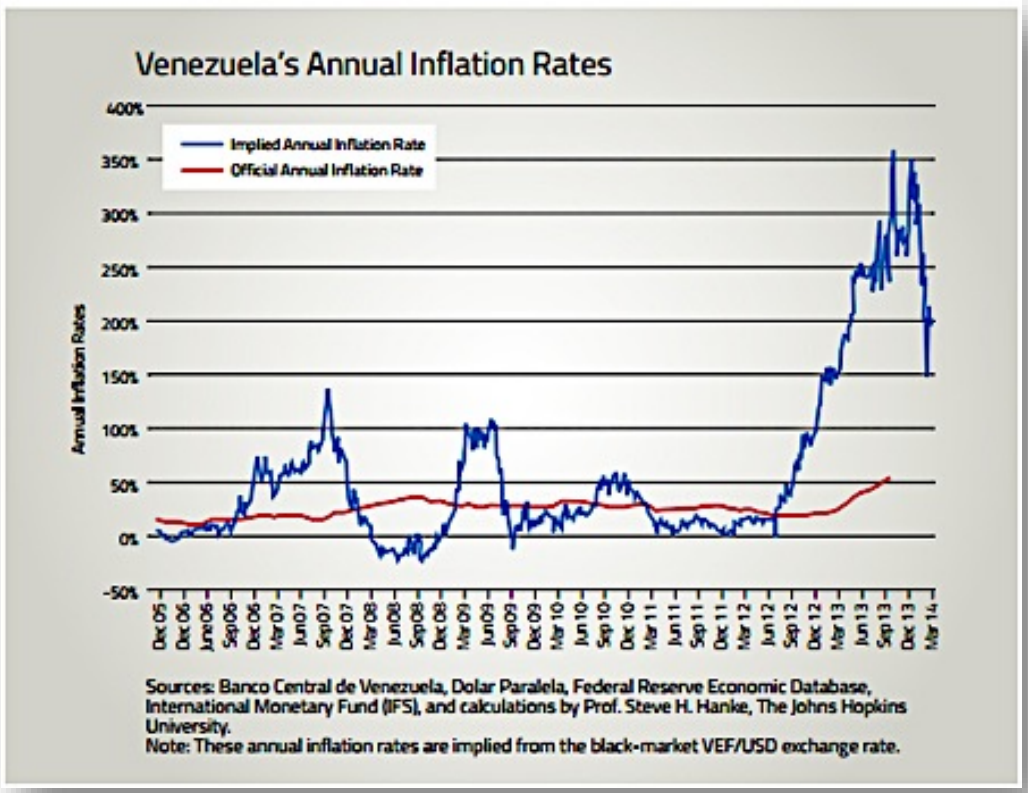
Inflation Soared to **56.2%** in 2013

Inflation is **nearly three times as high** as in 2012

Highest in the continent

Government has fixed the exchange rate at 6.3 bolivars for one dollar
Dried up the dollar supply, fuelling black market (nine times the official rate)

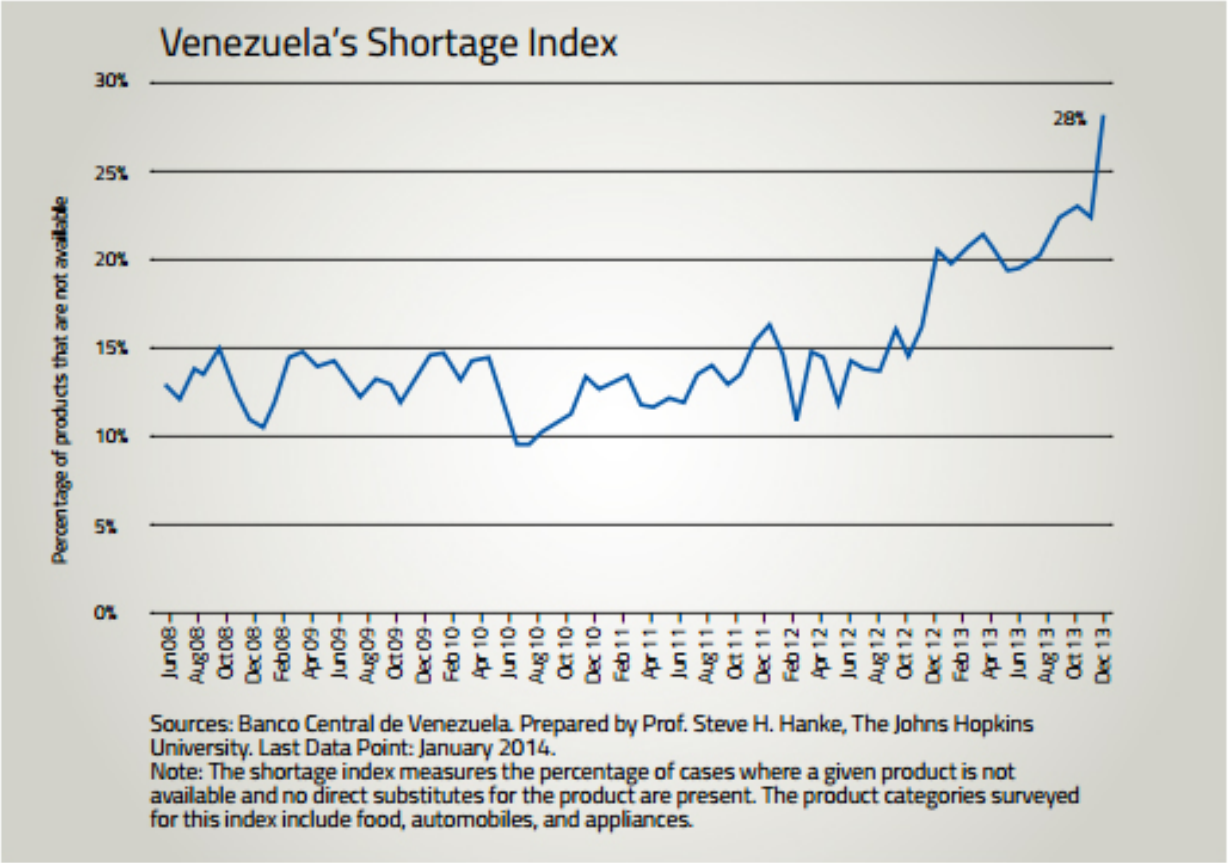
Implied Inflation



Shortages Prevail

- Oil rich country (biggest oil reserve in the world)
  - Heavily dependent on imports, ¾ of total consumption is imported
    - Suffered from shortages of basic goods ranging from meat to toilet paper.

Food, Automobiles, and Appliances




Garzon
Lo bueno
Garzon
SERVICE

Crime affects an economy

in many ways:

- Violence has plagued Venezuelans and their economy for years.
  - Venezuela ranked #3 as the economy most damaged by violence.- *World Economic Forum*
  - Worst country in attracting talent
    - Second worst in retaining it, after Myanmar
  - It limits international capital Flows
  - Hurt people's confidence and their potential for entrepreneurship
  - Venezuela may need $170 billion to significantly reduce crime

Airlines

- Lack of US dollars to pay multinational firms
- Oil partners of PDVSA have privilege to get dollars
- The following airlines have suspended flights:
  - American Airlines
  - Air Canada
  - United Airlines


HASTA
LA VICTORIA
SIEMPRE
COMANDANTE
COMANDANTE SUPREMO
PRESIDENTE
REPÚBLICA BOLIVARIANA DE VENEZUELA
GO RAFAEL CHAVÉZ FRÍAS
1954-2013

Disincentives for FDI

- **Before and After Chavez**
  - "You can blame food shortages and inflation; you can blame joblessness and corruption. Moreover, you need to account that Hugo Chavez is dead and his party lacks the legitimacy the he gave".
  - The Venezuelan economy is continuing its downward spiral.
  - Official threats if companies do not obey price controls
    - Penalties: expropriation, corruption charges and jail.


MADURO
VAMOS
POR
TI


Questions?

References

BLOOMBERG:
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www.eiu.com.helin.uri.edu/FileHandler.ashx?issue_id=1811029565&mode=pdf

Infant Mortality and Macroeconomic Changes in LATAM

BY: DANIEL MUJICA

Introduction

- Personal interest in Latin America
- Potential business opportunities in the region
- Healthcare is one of the main social issues
  - http://youtu.be/fRWh-Wznh0I

Literature Review

- *Ruhm* (2000) analyzed **how business cycles affect mortality in developed countries**. As a result, he found that upturns in economic activities are associated with increases in total mortality.
- *Gonzalez* (2008) set the basis for analyzing **infant mortality in less developed nations**- focusing in Mexico. He modified the model to improve the accuracy in emerging markets.
- *Cutler and Lozano* (2005) showed a positive relationship between **economic crisis and mortality**.

Literature Review

- *Ogburn and Thomas* (1922) suggest that **mortality rates tend to increase during economic booms**.
- *Ionidez et al.* (2012) state cyclical mortality is observed for macroeconomic fluctuations at all time scales. They specify that is important to **consider other factors besides macroeconomic indicators** to understand the real motives of changes in mortality rates.
- *Negrete* (2001) explains several reasons why **unemployment rate** in developing countries in Latin America is **perceived as a poor approach** to real business cycles.

Data

- **Cross-sectional data set** for 6 Latin American countries
- Time frame: **2002 – 2012** (10 years)
- Primary source: **World Bank Database**

Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
mort	110	21.44273	8.717024	12.7	52
popa	110	32.16364	4.877447	24	44
popb	110	61.86364	3.927035	52	68
gdpcap	110	5012.582	3114.32	893.95	13559.33
inc	110	3.178364	.8443623	1.5	4.93
health	110	334.5683	235.6617	51.07	1120.56

Specification of the Model

- **ln(mort) = β0 +β1gdpcap+ β2popunder5+ β2popover65+ β4inclow+ β5healthspcap + U**

  - Ln (mort): infant mortality under 5 years old

    - Gdpcap: gdp per capita *(negative relationship)*

    - Popunder5: percent of population aged 0-4 *(positive relationship)*

    - Popover65: percent of population aged 65 and older *(negative relationship)*

    - Inclow: Income share held by lowest 20% *(negative relationship)*

    - Healthspcap: health expenditure per capita *(negative relationship)*

Empirical Results

- The explanatory variables explain 72.06% of the variances in the data and three variables are significant with a 90% level of confidence.
- When holding every relevant factor constant (CP):
  - 1 unit increase in population A (unit: million) will lead to a 1.2 % increase in infant mortality rates in Latin America.
  - When GDP per capita increases by one unit, infant mortality rates should decrease by 0.00045%.
  - The model states that a unit increase in health care per capita will create a decrease of 0.006 units in infant mortality.

Conclusion

- Gross Domestic Product per Capita and Health care expenditure has a relevant effect over infant mortality in Latin America.

- One can assume that stable and growing economies in this region will have lower infant mortality rates in the long run.
- Population growth will drive to higher infant mortality rates- Ceteris Paribus.
- Income per capita was not valid to prove the assumption that levels of income will actually improve infant mortality rates.

Next Steps

- Model has substantial room for improvement.
  - Improve Dataset
    - Sampling error
    - Nonresponse and Response error
    - Increase number of relevant variables

French Unemployment:

The Crisis Continues

Created by:

William Manak

Daniel Mujica

Overview

- France has struggled with unemployment since 1995
  - UR (1995-2005) = 8%
- Since 2006, Unemployment rates increased to 9%
- President Chirac and the Prime Minister Villepin promised lower UR
- External social and political factors created difficult times for the government

Unemployment in France

- High rate of unemployment since 1990
  - Especially high for those between 15 and 24 and over 55
  - Some of the reasons for persistent unemployment problem:
    - Rigidity of labor market
    - Higher minimum wage than most countries
    - Generous unemployment benefits

Turmoil in the Welfare

- High rates of youth unemployment
  - Led to protests in suburbs in late 2005
    - Over 3,000 arrested, at least one dead
  - More protests occurred in March 2006, this time led by the middle class and students
    - Strike gathered over 1 million people

French Policy Responses

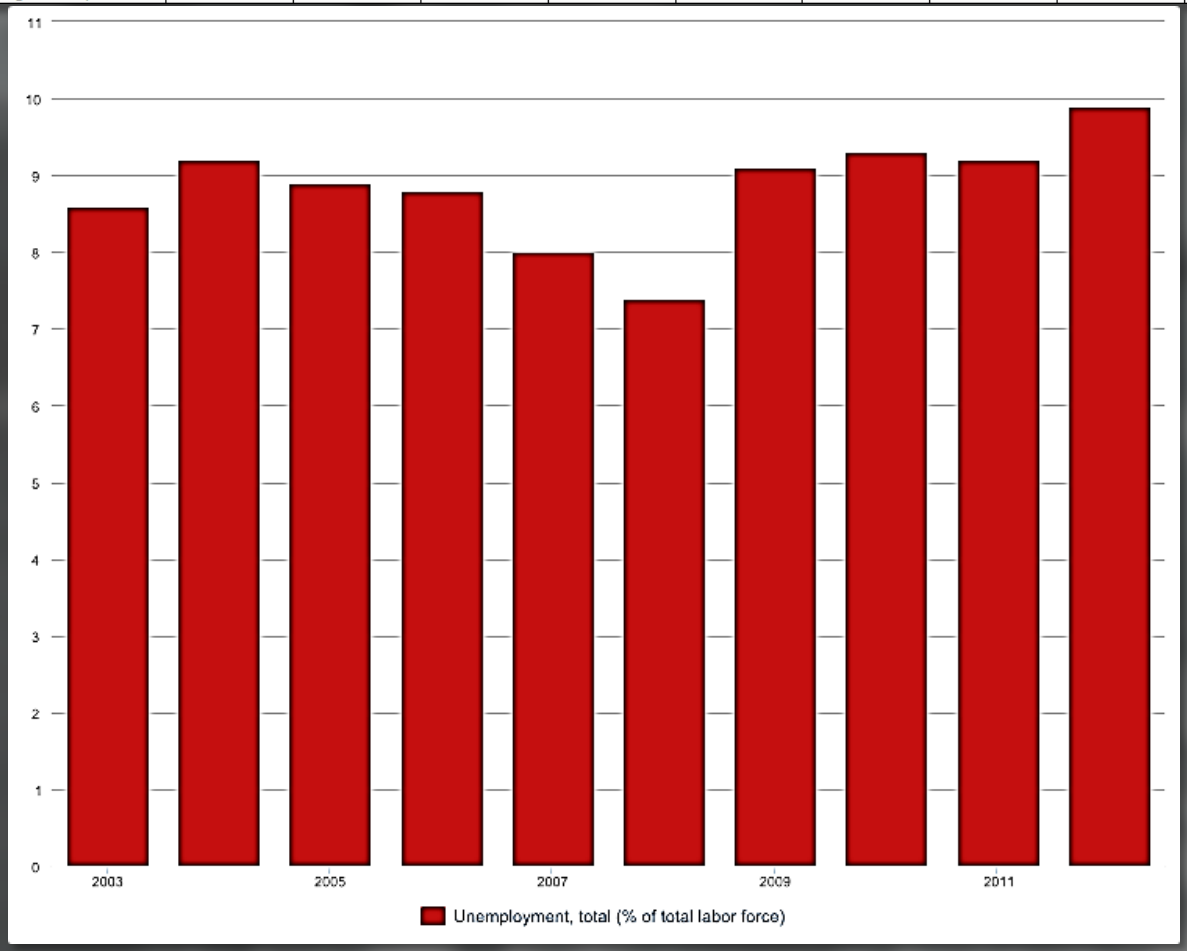
- President Chirac and Prime Minister de Villepin vowed to **reduce unemployment to under 2 million**
  - March *2006*: unemployment was *9%*, or 2.465 million
  - **CPE** (First Job Contract) made it **easier to lay off employees** under 26 within first 2 years for employers with more than 20 employees
    - *Goal*: encourage employers to take risks in hiring
    - *Heavily protested by youth groups*
  - Lowering of unemployment benefits
    - Also stricter guidelines for those receiving benefits

New Times, New Measures?

- Villepin knew he had to reduce unemployment after the CPE failed
  - Had *pressure from the president and 2007 upcoming elections*
    - Probably Villepin would make a bit for office
  - Two types of reforms were discussed:
    - **Strict conditions** for job searchers to receive benefits.
      - At the same time, this reform proposed merging some of the main employment services institutions.
    - **Privatize** the French employment service.
      - Brought hostility from trade unions – make profits from unemployed?

World Bank Charts

Indicator Name	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Overall
Population (Total)	62,242,474	62,702,121	63,176,246	63,617,975	64,012,572	64,371,099	64,702,921	65,031,235	65,371,613	65,696,689	
Long-term unemployment (% of total unemployment)	3%	4%	4%	4%	3%	3%	3%	4%	4%	4%	
Unemployment with primary education (% of total unemployment)	40%	39%	40%	40%	40%	40%	40%	40%	40%	40%	
Unemployment, total (% of total labor force)	9%	9%	9%	9%	8%	7%	9%	9%	9%	10%	
Unemployment, youth total (% of total labor force ages 15-24)	18%	20%	21%	22%	19%	19%	23%	23%	22%	24%	




Questions?