International Journal of Physical and Social Science

Vol. 9 Issue 11, November 2019, ISSN: 2249-5894 Impact Factor: 6.644

Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com

Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

A STATISTICAL ANALYSIS OF THE ECONOMIES OF ARGENTINA AND CHILE, AND A MEASUREMENT OF THEIR INTERDEPENDENCE

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Abstract

The purpose of this paper is to first do an extensive research about Chile and Argentina, two of the largest countries in Latin America. After the collection of all the information and the data, the authors will do a comparison of the two economies along with an economic analysis. In order to do this, the authors will present and discuss data for about twenty nine years, and this data will include things like the Gross Domestic Product, Exports and Imports, the unemployment rates, Growth rates, and the Inflation Rates. Also in the Appendix, we will run a number of regressions using our data, to measure they both have on each other.

Keywords: Argentina; Chile; Economies; Analysis; Interdependence;

1. History

In this section, we are going to do a historical analysis of both Chile and Argentina, as we believe that history is very important to a country's growth and development. Both of these countries have a history of thousands of years, and obviously we are not able to discuss their history entirely, but just some of the most important events that took place will be presented and discussed.

Chile

If we take a look at a map, we'll see that Chile has a very strange shape, which is very long, approximately 2650 miles, and fairly narrow of about 250 miles. As a result of its shape, it borders with three countries and the ocean on the forth side. On the North it shares a border with Peru, on the Northeast with Bolivia, and on the Eastern side, which is also the longest one; it shares a border with Argentina. On the West side, we find the Pacific Ocean. Chile has a population of about 17.9 million (2016), and its capital city is Santiago.

A quick review of Chile's history shows that the first Spanish settlers arrived in Santiago during 1541 and Concepcion in 1550, and what attracted them to this area was the climate and farming. Under Spanish rule, Northern and Central Chile belonged to Peru, and the South was under the control of the Araucarians until the 19th century, until independence was declared in 1810. Researching the history further we see that Chile defeated Bolivia and Peru in it's pursue to control the Atacama Desert, which had rich mineral deposits.

In more recent history, we learn that the left wing party candidate, by the name Salvador Allende, won the 1970 elections, and immediately nationalized the mines, industries and public services. A coup in 1973 overthrew him, and for the next 16 years Pinochet was the head of the military government. Democracy was restored in 1990 and the president was Patricio Azocar. Although it is not possible to discuss the history of Chile, the following is a list of some of the most important years in its history.

13,000 - 10,000 B.C	Arrival of first humans in Chile
500 A.D.	Human populations established throughout Chile
1470 - 1535	Inca conquest of communities north of the Rio Maule
1520	Ferdinand Magellan explores the strait that now bears his name
1541	Pedro de Valdivia leads an expedition to Chile and found Santiago
1567	Chile's first royal court, inaugurated at Concepcion
1700	End of Spanish Hapsburg dynasty with the death of Charles II
1810	Beginning of independence movement
1822	The United States officially recognizes Chile's independence
1837 - 1839	Chile at war with the Peru – Bolivian Confederation
1879 - 1883	War of the Pacific. Chile defeats Bolivia and Peru
1970	Salvador Allende becomes the first Socialist elected president
1973	Military overthrows Salvador Allende on Sep. 11
1978	Pinochet declares amnesty for political crimes committed since Sept. 11, 1973
2003	Chile opposes U.S. invasion of Iraq

Again this list does not cover the whole history of Chile, but it gives us a good idea about some of the most important events that took place in Chile over the years

Argentina

Argentina is the second country in size and population in South America after Brazil. Argentina's population in 2016 was 43.85 million. On the south Argentina borders with Bolivia and Paraguay on the north. On the east we find Brazil and Uruguay.

Historically, Argentina's first exploration was done by Juan Diaz de Solis in 1516, and continued to develop under Spanish rule, with Buenos Aires being established in 1580. Finally in 1816 Argentina declared its independence from Spain, and the early stages of the independence were characterized by a struggle between two groups, the Unitarists and the Federalists, which had different approaches to government.

In more recent history, we see that Argentina remained neutral during both World War I and II, although towards the end of World War II declared war against the Axis powers. The first postwar president was Juan Peron, but due to his authoritarian control, a coup by the armed forces sent him to exile in 1955. Peron returned in 1973, and after his death his wife became the first woman president.

Just like Chile, Argentina has a long history that cannot be discussed in a few pages. Below, we are going to list chronologically some of the most important events.

12000 B.C.	Migrating hunting bands arrive in Argentina
1492 A.D.	Christopher Columbus arrives in Caribbean Islands
1516	Juan Diaz de Solis explores the Rio de la Plata estuary
1535	Pedro de Mendoza found Buenos Aires
1588	City of Corrientes is founded; first slaves are imported to Buenos Aires
1776	Viceroyalty of the Rio de la Plata is established
1787	The Filipina Company gains monopoly to import slaves to Buenos Aires
1810	Cabildo abierto establishes creole government at Buenos Aires, slave trade
	is outlawed
1820	Buenos Aires government is overthrown
1853	Constitution establishes the Republic of Argentina
1893	Financial crisis occurs
1919	Right wing vigilantes kill hundreds in Jewish neighborhoods of Buenos
	Aires
1946	Peron is elected president
1955	Military takes power in the Revolucion Libertadora, Peron lives in exile
	the next 18 years

1973	Peronists win presidential elections, Peron returns to presidency
1983	Inflation rises to 343 percent and the International debt reaches \$45 Bil.
1991	Mercosur is formed by Argentina and three neighbors
2002	Peso is severed from dollar and falls in value by 40 percent

2. Current Literature – Statistical Analysis

In this section the authors will present and discuss the present economic situation in both Chile and Argentina. In doing this, the reader should be able to get a better picture about these two countries. Following this analysis, we are going to present several years of economic data for the two countries in order to be able to do a better and more accurate comparison between these two South America countries.

At this point we would like to present some very recent indicators about Chile's economy, and after that we'll present the same indicators for Argentina for comparison.

Chile has a population of about 17.9 million (2016), and out of these 17.9 million, about 8.762 million make up the labor force. One of the biggest economic problems of Chile, related to the labor force, is the unemployment. In 2008 the unemployment rate was 7.75%, but in 2009 it jumped to 10%, which is very high by any standards, but by 2016 it dropped down to 6.5. Another major economic problem of Chile is that almost one fifth of its population is below the poverty line. Other interesting economic indicators of Chile's economy are the following: GDP \$150.4 bill. (2009), which is not bad, but it had a -1.5% growth rate, and again by 2016 it jumped to \$269 billion, and increased the per capita GDP to \$24100, up from \$14700 in 2009. Chile's economy does not have only bad indicators, and one very good indicator is the inflation rate which is almost nonexistent. During 2009 it was 1.7% down from 8.7% in 2008, to reach 3.8% during 2016. So obviously some things are moving in the right direction.

The last two things we would like to mention are trade and direct investment (FDI). During 2009 Chile had total exports of \$48.85 billion made up by copper, fruit, fish products, chemicals and wine. On the other hand they had total imports of \$40.91 bill. made up by petroleum products, chemicals, industrial machinery etc. Obviously during 2009 Chile had a trade surplus of \$7.97 billion which is good, but it was down about a billion from 2008. From these figures we derive the conclusion that Chile has a lot to offer and as a country it needs to concentrate on its exports.

Finally we would like to take a look at FDI both at home and abroad. In 2009 the FDI at home was \$115 billion, up from \$108 in the previous year, and FDI abroad was \$32 billion in 2009 up from \$25 in the previous year. Once more these figures lead us to the conclusion that Chile is very attractive to foreign investors, since the FDI at home is almost 4 times bigger than the FDI abroad, so it needs to concentrate on bringing more foreign direct investment into the country.

In Argentina, the situation is a little different than Chile. After all as our data will show, Argentina is a bigger country with a bigger economy. Argentina has a population of almost 443.85 million (2016), more than two times that of Chile, and a labor force size of almost 17.76 million, which is the population size of Chile. Its unemployment, although high and rising, is lower than Chile's. During 2016 it was 13.1% whereas in 2015 it was 12%, another indication that world economic crisis impacted Argentina as well. Another indicator that proves the impact of the world crisis is the GDP. In 2009 it was \$301 billion, and this had a negative growth of 2.5% from the previous year. By 2016 it reached \$445 billion and it still had a negative growth of 2.29% from the previous year. One of the biggest advantages that Chile has over Argentina is population under the poverty line. In Chile it is about 14.4% of the population whereas in Argentina it is around 32.2%. With respect to trade, Argentina also had a surplus of \$80.9 billion in 2016. Argentina exported soybeans, petroleum and gas, vehicles, corn and wheat, and imported machinery, organic chemicals and plastics. In the FDI area, Argentina has almost a 3 to 1 advantage in the incoming over the FDI abroad, which makes it obvious that investors like Argentina for investments, and they need to promote that further.

In the pages that follow we are going to show a lot of data for both countries both in a tabular form and a graphical form to make comparison easier. Table 1 on the next page shows the GDP, the Growth rates, the Inflation rates, and the population size between 1970 and 2016. We believe we have a large enough sample for a better picture.

Figure 1 below shows the Gross Domestic Product for Chile and Argentina. Obviously Argentina is a bigger economy but at least during the last several years they are both growing.

FIGURE 1 GDP ARGENTINA – CHILE 1970 - 2016 in 2010 U.S. DOLLARS

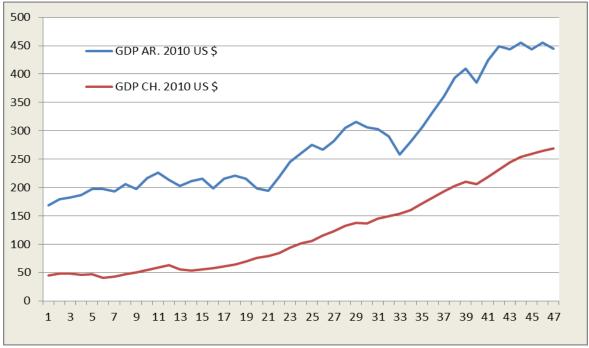


				TABLE	1			
			ND ADA	TENTETN		1070	2016	
		CHILE A	ND AKO	JENTIN	A DATA	1 1970 -	2016	
YEAR	GDP AR.	GDP CH.	GDP AR.	GDP CH.	POPUL.	POPUL.	INFLAT.	INFLAT
	2010 US \$	2010 US \$	GR. RAT	GR. RAT	ARGENT	CHILE	ARG. %	CHILE 9
1970		44.5	3.04		23.9	9.56	13.58	32.5
1971	179	48.7	5.66	9.4	24.36	9.74	34.73	20.0
1972	182	48.2	1.63	-1.02	24.78	9.92	58.44	77
1973	187	45.8	2.81	-5.03	25.21	10.09	61.24	352.
1974	197	46.9	5.53	2.38	25.64	10.26	23.47	504.
1975	197	40.8	-0.03	-12.91	26.06	10.43	182.92	374.
1976	193	42.4	-2.02	3.83	26.48	10.6	443.96	211.
1977	206	46.8	6.93	10.44	26.88	10.76	176	91.
1978	197	50.4	-4.51	7.7	27.28	10.93	175.51	40.
1979	217	54.7	10.22	8.41	27.68	11.09	159.51	33.
1980	226	59.1	4.15	7.98	28.11	11.26	100.76	35.
1981	213	62.9	-5.69	6.52	28.54	11.43	104.46	19.
1982	203	56	-4.96	-11.01	28.99	11.61	164.77	9.
1983	211	53.2	3.88		29.45	11.79	343.81	27.
1984		55.4	2.21	4.1	29.92	11.98	626.72	19.
1985	199	57.6	-7.59	4	30.39	12.18	672.18	30
1986		60.7	7.87	5.37	30.86	12.38	90.09	19.
1987	221	64.6	2.91	6.46	31.32	12.59	131.33	19.
1988		69.3	-2.56		31.79	12.8	342.95	14
1989			-7.49		32.26	13.02	3079.81	17.
1990		78.8	-2.39		32.73	13.24	2313.96	26.
1990	219	84.9		7.8	33.19	13.45	171.67	21.
1991	245	94.4	11.94			13.43	24.89	15.
1992	<u> </u>	101	5.91		34.11	13.88		12.
1993	275	106			34.11	14.09		
1994		115	5.83 -2.84		34.99	14.09	4.18 3.37	11. 8.
1993		123			35.42			
			5.53			14.49	0.16	7.
1997 1998	305	132	8.11	7.42	35.83	14.69	0.53	6.
	316	138	3.85	4.32	36.24	14.88	0.92	5.
1999			-3.38		36.65		-1.17	3.
2000	1	145	-0.79		37.06		-0.94	3.
2001	290	149	-4.41	3.3	37.47	15.44	-1.07	3.
2002					37.89	15.62	25.87	2.
2003					38.31	15.79	13.44	2.
2004			9.03		38.73	15.93	4.42	1
2005						16.14	9.63	3
2006					39.56		10.9	
2007		203	9.01	4.9	39.97	16.49	8.83	,
2008					40.38	16.66		8
2009						16.82	6.28	0
2010					41.22	16.99	10.78	
2011	449	232			41.66	17.15		3
2012			-1.03	5.32	42.09	17.3	10.03	
2013				4.04	42.54	17.46		1.
2014				1.9	42.98	17.61	18.4	4.
2015						17.76		4.
2016	445	269	-2.29	1.58	43.85	17.9	26.4	3.
OURCE:	https://data.v							
	THE WOR		(World De	velopment I	ndicators)			
iDP in billio	ons of 2010 U n millions	J.S. \$						

Figure 2 below shows the population for both countries. Obviously their population is increasing but the population size of Argentina is much bigger than Chile's.

FIGURE 2 POPULATION ARGENTINA – CHILE 1970 – 2016

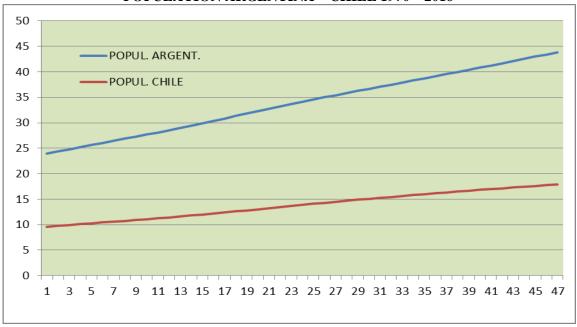


FIGURE 3
INFLATION ARGENTINA – CHILE 1970 – 2013

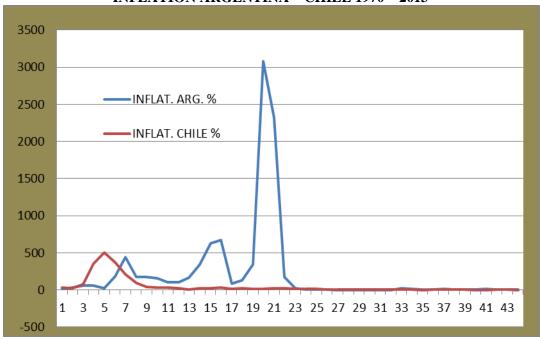


Figure 3 above shows the Inflation rates for both Chile and Argentina. The inflation rates for both countries during the last several years has been very low but they did have periods of high inflation as well.

				TABLE	2			
	CIII	TE AND	ADCEN	JTTNIA T	\)70 201	<u> </u>	
	CHI	LE AND	AKGE	NI IINA I	AIA IS	970 - 201	. O	
YEAR	EXPORTS	IMPORTS	NET EXE	FYPORS	IMPORT	NET EXP	IINEMP	INFMP
LAK		AR. US \$						CH. %
1970		6.94	2.95	4.72	5.35		4.8	3.
1971	8.91	7.77	1.14	4.76	5.8			3.
1972	9.09	7.39	1.7	4.04	5.99		6.6	3.
1973	10.4	7.3	3.1	4.16	5.67	-1.51	5.6	5.
1974	10.4		2.71	6.06	5.86	0.2	3.4	9.
1975	9.42	7.83	1.59	6.21	3.61	2.6	2.3	14.6
1976			6.21	7.72	3.76		4.5	12.7
1977	15.8	8.48	7.32	8.64	5.09		2.8	11.8
1978	17.2		9.16	9.6	5.98		2.8	14.2
1979			4.2	11	7.34		2	13.6
1980	15.8	18.2	-2.4	12.5	8.73		2.3	11
1981	16.6		-0.1	11.4	10.1	1.3	4.5	10
1982	17.3	9.59	7.71	12	6.56	5.44	4.73	19
1983	17.7	8.93	8.77	12	5.36	6.64	4.17	14.6
1984	17.2	9.35	7.85	12.2	6.05	6.15	3.65	13.9
1985	19.9	8.13	11.77	13.7	5.45	8.25	5.3	11.7
1986	17.9	9.58	8.32	15	5.89	9.11	4.4	8.7
1987	17.3	10.7	6.6	16.1	6.98	9.12	5.3	9.2
1988	20.5	9.7	10.8	18	7.88	10.12	6	6.2
1989	22	8.1	13.9	20.9	9.85	11.05	7.3	5.2
1990	26	7.94	18.06	22.7	10.4	12.3	7.06	5.6
1991	25	14.3	10.7	25.5	11.1	14.4	6.32	5.2
1992	24.8	23.7	1.1	29.1	13.6	15.5	6.36	4.3
1993	25.8	27.2	-1.4	30.1	15.5	14.6	10.1	4.4
1994	29.7	32.9	-3.2	33.6	17.1	16.5	11.95	5.8
1995	36.4	29.7	6.7	37.3	21.3	16	6.68	4
1996	39.2	34.9	4.3	41.7	23.9	17.8	17.2	5.3
1997	43.9	44.3	-0.4	46.4	27	19.4	14.89	5.3
1998	48.6	48	0.6	48.8	28.8	20	12.69	7.1
1999	48	42.6	5.4	52.1	26	26.1	14.1	8.9
2000	49.3	42.6	6.7	54.8	28.7	26.1	15.02	8.3
2001	50.6	36.6	14	58.7	30.3	28.4	17.35	7.8
2002	52.2	18.3	33.9	60.1	30.8	29.3	19.61	7.8
2003	55.3	25.2	30.1	64	32.6	31.4	16.03	7.3
2004	59.8	35.3	24.5	73.2	38.9	34.3	12.63	7.1
2005	67.5	40.8	26.7	75.3	46	29.3	10.6	6.9
2006	71.3	45.3	26	79.1	51.5	27.6	9.45	6.0
2007	77.1	54.2	22.9	84.8	58.6	26.2	8.47	7.2
2008	77.7	61.6	16.1	84.2	65.3	18.9	7.89	7.4
2009	70.4	50.2	20.2	80.7	54.5	26.2	9.09	8.0
2010	80.2	67.9	12.3	82.5	68.4	14.1	7.38	7.1
2011	83.5	82.9	0.6	87	78.8	8.2	7.05	6
2012	80.1	79	1.1	87.3	82.9	4.4	7.34	6.0
2013	77.3	82.1	-4.8	90.1	84.6	5.5	6.61	5.0
2014	71.9	72.6	-0.7	90.5	79	11.5	7.02	6.0
2015	71.5	76.8	-5.3	88.8	76.8	12	7.15	5.
2016	74.1	80.9	-6.8	88.7	75.6		8.69	6
OURCE:	https://data.v	worldbank.or	rg/data-cata	log				
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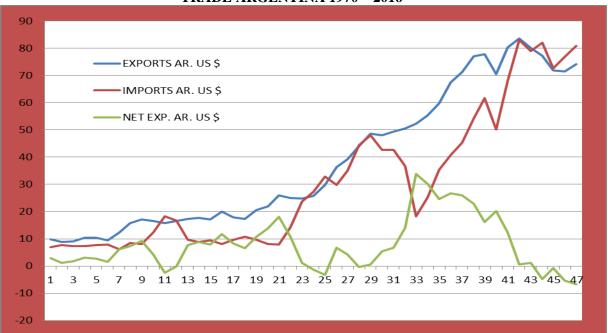
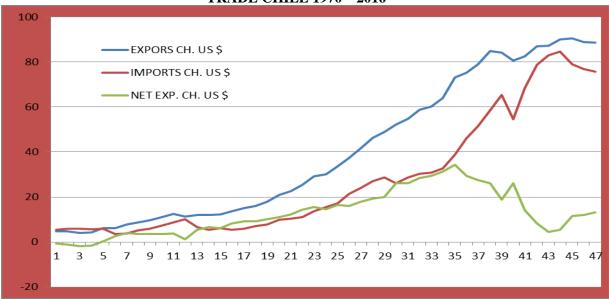


FIGURE 5 TRADE CHILE 1970 – 2016



Figures 4 and 5 on the previous page show the trade for each country. It seems that the two countries are going in different directions. For Argentina we see that exports are declining and imports are increasing which obviously ends up in negative trade balance. On the other hand, in Chile the situation is the exact opposite. Exports are increasing and imports are decreasing and that is why trade balance is positive.

In the last figure, Figure 6 we see a comparison of the unemployment rates in both countries. Obviously both countries had their ups and downs, and some of them were very severe, during the last several years, it seems that they were able to control it. They both have fairly low unemployment rates, and they are both around at the same level.

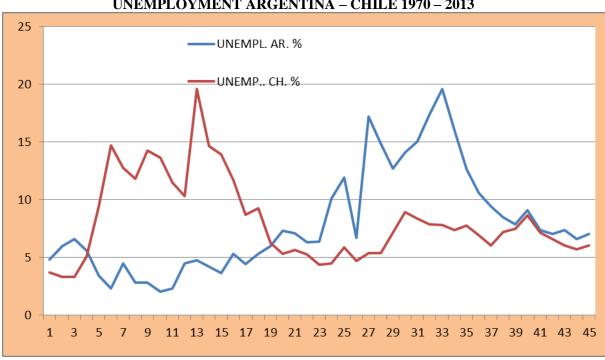


FIGURE 6 UNEMPLOYMENT ARGENTINA – CHILE 1970 – 2013

3. Conclusion

In conclusion as was mentioned in a previous section, the purpose of the paper was to do a comparative study between Chile and Argentina, and the data presented did just that. Obviously the two economies are of different size, since Chile has a population of 16.5 million and Argentina on the other hand has a labor force of more than 16.5 million. Even though they are different in size, they both have areas in which they have advantage over the other. For example Chile has an unemployment rate of more than 10% (2009) and Argentina's unemployment is around 9%. They both have high unemployment but Argentina is in a better shape. Another area in which Argentina has an advantage over Chile is the population under the poverty line. Chile has about a fifth of its population under the poverty line, whereas in Argentina that number is under 13%. On the other hand Chile has an advantage over Argentina in inflation. Chile's inflation during 2009 was almost non-existent at 1.7% whereas Argentina's was 6.2% and rising.

There is one area in which both countries are doing very well, and we saw that on Table 1 and Figure 3. This is the Foreign Direct Investment (FDI). Both countries have a surplus of incoming FDI over outgoing. For Chile the ratio is almost 4 to 1, and in Argentina it is 3 to 1. This is something that both countries need to take a closer look because it is obvious that foreign investors see both of them as good countries to invest in, and they need to promote that in order to attract more foreign investments, as they have a lot to gain from that.

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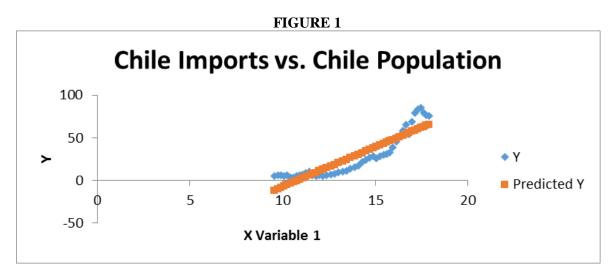
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Appendix

In this section of the paper, the authors ran several regressions using the data presented earlier in the paper. The regressions are an attempt to measure aspects of the economies of Chile and of Argentina. The hypothesis for each test is presented along with the findings and a graph illustrating the regression.

Model #1

The first model uses Chile's population as independent and Chile's Imports as dependent. The hypothesis is that Chile's imports does not depend on its population. The value of the R² is 0.811, so roughly 81% of Chile's imports depends on its population. The P value for this hypothesis test is 6.85×10^{-18} . Since this value is smaller than 0.05, the hypothesis is rejected. These results are shown below in Figure 1.

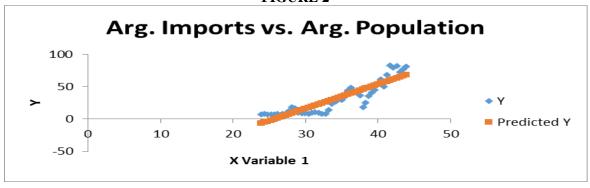


Model #2

The second model uses Argentina's population as independent and Argentina's imports as dependent. The hypothesis is that Argentina's imports does not depend on its population. The value of the R^2 is 0.802, so roughly 80% of Argentina's imports depends on its population. The P value for this hypothesis test is $2x10^{-7}$. Since this value is smaller than 0.05, the hypothesis is rejected.

These results are shown below in Figure 2.

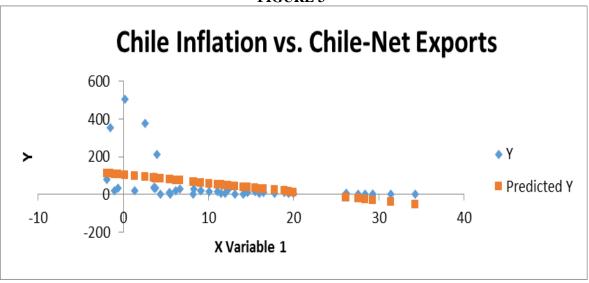
FIGURE 2



Model #3

The third model uses Chile's net exports as independent and Chile's Inflation as dependent. The hypothesis is that Chile's Inflation does not depend on its net exports. The value of the R² is 0.193, so roughly 19% of Chile's Inflation depends on its net exports. The P value for this hypothesis test is 0.002. Since this value is smaller than 0.05, the hypothesis is rejected. These results are shown in Figure 3 on the next page.

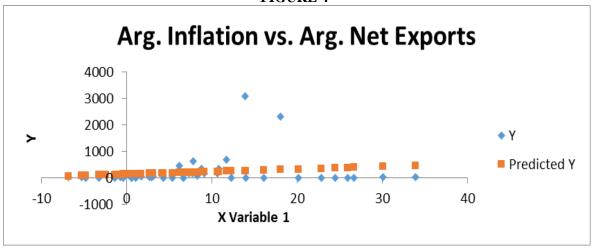
FIGURE 3



Model #4

The fourth model uses Argentina's net exports as independent and Argentina's Inflation as dependent. The hypothesis is that Argentina's Inflation does not depend on its net exports. The value of the R² is 0.027, so roughly 3% of Argentina's Inflation depends on its net exports. The P value for this hypothesis test is 0.272. Since this value is larger than 0.05, the hypothesis is accepted. These results are shown below in Figure 4.

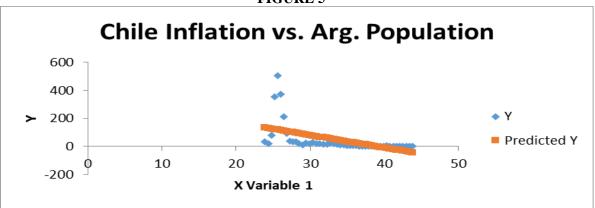
FIGURE 4



Model #5

The fifth model uses Argentina's population as independent and Chile's inflation as dependent. The hypothesis is that Chile's inflation does not depend on Argentina's population. The value of the R^2 is 0.263, so roughly 26% of Chile's inflation depends on Argentina's population. The P value for this hypothesis test is 0.002. Since this value is smaller than 0.05, the hypothesis is rejected. These results are shown below in Figure 5.

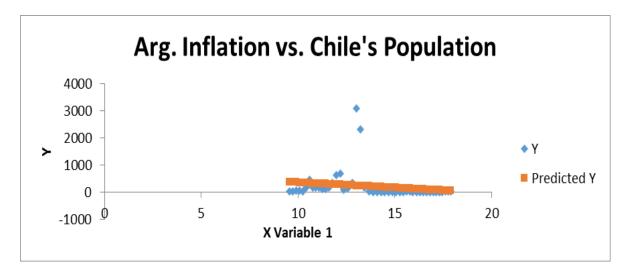
FIGURE 5



Model #6

The final model uses Chile's population as independent and Argentina's inflation as dependent. The hypothesis is that Argentina's inflation does not depend on Chile's population. The value of the R^2 is 0.032, so roughly 3% of Argentina's inflation depends on Chile's population. The P value for this hypothesis test is 0.231. Since this value is larger than 0.05, the hypothesis is accepted. These results are shown in Figure 6 on the next page.

FIGURE 6



Conclusion

In concluding the appendix, the authors attempted to measure aspects of the economies of Chile and of Argentina. We believe this way we can get a picture of how the two countries' economies are related to each other. Even though the results are interesting, they are not 100% conclusive. More work is needed before we can say that the results are solid.

Finally we would like to say that this paper is not finished. We are looking into different statistical models that we like to use in order to give us a better understanding about the two economies, and any possible connections. To this end any suggestions and recommendations will be greatly appreciated.