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Abstract:

Arthur Okun claimed that when a country's unemployment rate fell, the GDP expanded. This paper investigates the claim of Arthur Okun and the effect of unemployment rates and GDP of a country on each other. Data from three countries, namely, USA, Japan, and France, were tested to see if there was a causal link between the two variables. It was found that the proposed law of Arthur Okun did not hold. In the USA, there was a two way causality link but different directions of effect. France and Japan did not have a causal link between the two variables.

1. Introduction

American Economist Arthur Okun proposed an observation that a country's unemployment and GDP were intrinsically linked. He observed that when a country's unemployment decreased, the GDP of the country increased by a certain factor (known as the Okun coefficient). The observation was made in the United States, and has since been studied in many countries. Each country has its own Okun's coefficient showing the effect unemployment and GDP have on each other. The relationship has become known as Okun's law.

Arthur Okun proposed the relationship in 1962. It has become a well-established postulate in the economic community. In this paper, the relationship between unemployment and GDP of a country will be revisited. It will evaluate the correlation and causality between the two components. This will examine if Okun's law is observed and also whether GDP causes the change in unemployment or vice versa, whether both cause each other, or whether neither causes the other regardless of correlation. The statistics will be refreshed to the current day, reflecting the relationship in modern times. Three countries will be observed, the United States of America (USA), France, and Japan. This will reflect not only the modern time period but a geographical component to the Okun's Law theory. The paper will present econometric regression results testing the validity of Okun's Law across geographical regions and in modern time periods.

2. Literature Review

Literature on Okun's law is wide and varied. It stresses five different possible causations between GDP and unemployment rate. This paper looks to find which causation exists. The five causations are, a positive change in GDP causes a negative change in unemployment, a positive change in GDP causes a positive change in unemployment, a positive change in unemployment causes a negative change in GDP, a positive change in unemployment causes a positive change in GDP, and no causation effect between the two variables.

Okun (1962) detailed two empirical relationships between output and unemployment: (i) quarterly changes in the unemployment rate were related to quarterly growth in real gross domestic product (GDP) and (ii) deviations in the unemployment rate were related to deviations in GDP from its potential. Those two findings were known as the *difference* and *gaps* versions of Okun's Law.

Difference version - Chamberlin (2011) has detailed the difference version in the following regression form: "Change in unemployment rate = a+b*real output growth" and the regression coefficient b is often referred to as Okun's coefficient and is ordinarily expected to be negative. Irfan (2010) provided the link between the natural log of real output (Yt) and the natural log of unemployment rate (Ut) as "$Yt-Yt_{-1} = \alpha + \beta\ (Ut - Ut_{-1}) + \eta t$"

Gap version - Chamberlin (2011) wrote the gap version as "Unemployment rate = a+b*(gap between potential output and actual output). He explained that if output falls below potential, giving rise to a negative output, unemployment would be expected to increase and if actual output exceeds potential output, unemployment is expected to fall. Potential output is the equilibrium level of output where the economy can grow without experiencing inflationary or deflationary pressures. Irfan (2010) defined "Gap Model" in the following statistical relationship: "$Yt-Yt^* = \alpha + \beta (Ut - Ut^*) + \eta t$" where Yt^* refers to the log of potential output, Ut^* is the natural rate of unemployment, where α is the intercept, β is the Okun's coefficient computing how much variation in the unemployment to changes in output and ηt is the disturbance term.

A positive change in GDP causes a negative change in unemployment.

Arthur Okun (1962) documented that U.S. unemployment tended to fall by 1 percentage point for every 3-percentage-point rise in gross national product (i.e., output); subsequently, observers dubbed this empirical regularity "Okun's law".

A positive change in GDP causes a positive change in unemployment

A way that shows that GDP can positively affect unemployment is illustrated by Burgen, Meyer and Tasci (2012). In the paper it is stated by Burgen, Meyer, and Tasci (2012) that it is "important to recognize that Okun's law is just an empirical relationship, not necessarily reflecting a structural link between output growth and the unemployment rate. Also, the relationship might change over time as the dynamics of the labor market change."

Burgen, Meyer, and Tasci go on to speak further of the relationship in Okun's law. They look at data over 40 years and see that there is a "strong correlation between output growth and increases in unemployment rate when it is below potential, but disappears when output is growing above potential" (Burgen, Meyer, and Tasci, 2012).

Unemployment is present even when the economy is strong. Once unemployment reaches a certain level it may not go below that level even if growth continues (Burgen, Meyer, and Tasci, 2012).

A positive change in unemployment causes a negative change in GDP

Wen and Chen (2012) stated that for "each 1-perentage-point increase (decrease) in the unemployment rate from its natural rate, total output on average will be lowered (raised) by nearly 2 percent relative to its long-run HP trend."

Wen and Chen go on to speak of the relationship between the variables of Okun's law. In the paper they say that Okun's law is based on the fact that output and production depends on the labor involved, leading to a positive relationship of output to employment and thus negative relationship between output and unemployment (Wen and Chen (2012)).

Chamberlin (2011) highlighted that in past UK recessions, unemployment has continued to rise even as the economy returns to growth.

A positive change in unemployment causes a positive change in GDP

Burgen, Meyer and Tasci (2012) and Altig, Fitzgerald, and Rupert (1997) mention that the relationship of one variable affecting the other in a certain direction can alter over time. With positive unemployment causing a negative change in GDP, it can change directions under various market conditions.

No effect

Altig, Fitzgerald, and Rupert (1997) state that while this is the original thought process, it does not always hold in the same direction and may change entirely, due mainly to productivity increases or decreases. This shows that there is not always a cut and dry exchange with Okun's law and the GDP or unemployment is affected by other variables.

Other studies not only include unemployment and GDP of countries, but other variables as well. These sources view Okun's law with slight modifications to see if Okun's law holds under each circumstance.

Owyang and Sekhposyan (2012) say that Okun's law does not always hold over the short run, in particular when dealing with recessions and the recovery after. Especially after the recovery, periods of large growth in output does not correspond with the lessening of the unemployment rate.

Kitov and Kitov (2012) modified Okun's law to show the reflection of unemployment on GDP per capita rather real GDP. They tested this hypothesis in developed countries and found that Okun's law held for the developed countries with GDP per capita.

Neely (2010) focused on the Okun coefficient of countries. He states that the United States, Canada, and the United Kingdom have smaller Okun coefficients than most other industrialized nations. This is likely a result of these three countries having less regulation on labor markets, allowing companies to lay workers off easier when there is a slowdown in the economy.

3. Data Description and Statistical Model

The data we obtained are harmonized unemployment percentages and raw GDP numbers (Millions of national currency, current prices, and annual levels, seasonally adjusted) for the following countries and respective time periods: (a) USA - from 1955 Q1 to 2012 Q3 (Number of observations: 229) (b) FRANCE - from 1983 Q 1 to 2012 Q 3(Number of observations: 119) (c) JAPAN - from 1960 Q 1 to 2012 Q3 (Number of observations: 211)

All data were retrieved from OECD (Organization for Economic Co-operation and Development).

The statistical model we employed is $g_t = \beta_1 + \beta_2 u_t$. Where g_t=change in GDP and u_t=change in unemployment.

4. Empirical Method

The Augmented Dickey Fuller (ADF) test will be used to test for stationarity. This process is laid out by Irfan, L., Muhammed S., Jalil, M. et al. (2012) where it states "If any variable is found to be stationary, it will be tested for stationarity at its first difference form." This will be continued until stationarity is found, after which the variables will be submitted to a co-integration test (Irfan, L., Muhammed S., Jalil, M. et al. (2012)).

The Engle Granger (1987) is employed for long run co-integration since this study consists of a bi-variate model.

The following steps have been taken

1. Each variable is tested for stationarity. For Engle Granger to be used, it is necessary that the variables are integrated in same order (Irfan, L., Muhammed S., Jalil, M. et al. (2012)). There is no co-integration if at different orders, and if at same level no additional steps are needed (Irfan, L., Muhammed S., Jalil, M. et al. (2012)).
2. If the results show that the variables are integrated at the same order, the next step is to calculate the long run relationship in the form as –the left hand side is "GDP" and right hand side is the "Unemployment". If the sequence of residuals from this regression is stationary, the sequences are said to be co-integrated of order (1,1). But, if residuals are non-stationary, it is concluded that there is no long run equilibrium relationship or no co-integration lies between the GDP and Unemployment.

5. Estimation Results

We began by examining USA, followed by France and Japan.

USA – refer to Appendix 1 and relevant tables

Table 1 shows the results of ADF Unit Root Tests for USA GDP and Unemployment. lnGDPUSA has a unit root (I(I)). The First Difference was taken (dlnGDPUSA) is I(0), i.e. no unit root. The UNEMP has no unit root, i.e. I(0). Since they are integrated at different levels, no further test for co-integration is necessary. The VAR approach can be applied directly to estimate the time series lnGDPUSA and UNEMPUSA.

Table 2 shows that the optimal lag length given by SIC was 4.

Table 3 shows that with the adjusted lag length, we arrived at the conclusions that at 4 lag lengths –

(i) The GDP has a negative effect on Unemployment with a magnitude of -6.203642 (lag 1) at a significant level of 5%. The other lags were not significant at 5% level. Observed R square of 97.0944% suggests that the movements in GDP can almost completely explain the movement in unemployment during the period (Adjusted R Square is 96.9863%).

(ii) Unemployment is significant (at 5%) at 1 and 2 lags with magnitudes of -0.005835 and 0.014896 respectively whilst results at lags 3 and 4 are not significant at 5% level. However, it is worth mentioning that the resulting R Square is only 31.4252%, which means that only 31% variations in GDP can only be explained by movements in Unemployment.

Table 4 shows that the Engle-Granger showed that unemployment and GDP causes each other at 5% level of significance.

France - refer to Appendix 2 and relevant tables

Table 1 shows that the ADF results Unit Root tests for GDP and Unemployment. lnGDP of France was shown to have a unit root (I(1)). Following this we took the first difference and found that dlnGDP for France does not have a unit root (I (0)). The Unemployment also is shown to have a unit root (I (1)). We again took the first difference and found that dunemployment did not have a unit root (I (0)). Since these variables are integrated at the same level, we did a test for co-integration.

Table 2 & 3 shows the results of the co-integration by verifying whether the residual (regressing lnGDPFRANCE against UNEMPFRANCE) is stationary and we found that no co-integration existed. Since there is no co-integration, the VAR approach can be used.

Table 4 shows the optimal lag length given by SIC is 1.

Table 5 shows that with the adjusted lag length we see that the results are not significant at 5% for both GDP and Unemployment, suggesting that change in GDP does not cause a change in Unemployment and vice versa.

Table 6 shows that the Granger Causality test at 5% level of significance confirms the above finding that neither unemployment nor GDP has effect on the other variable.

Japan - refer to Appendix 3 and relevant tables

Table 1 shows the results of the ADF Unit Root tests for GDP and Unemployment for Japan. lnGDP of Japan was shown to have a unit root (I(1)). Following this we took the first difference and found that dlnGDP does not have a unit root (I (0)). The Unemployment is, however, shown to have a unit root (I (1)). We took the first difference and found that dunemployment did not have a unit root (I (0)). Since these are integrated at the same level, we tested the residual of the regression of lnGDP and unemployment for co-integration.

Table 2 & 3 shows that there was no co-integration. Since no co-integration existed, we proceeded with the VAR approach.

Table 4 shows the optimal lag length given by SIC is 2.

Table 5 shows that with the adjusted lag length we see that the results are not significant at 5% for both GDP and Unemployment, suggesting that change in GDP does not cause a change in Unemployment and vice versa.

Table 6 shows that from the Granger Causality test at 5% level of significance, it can be seen that it confirms the above finding that neither unemployment nor GDP has effect on the other variable.

6. Main Conclusions

Okun's law does not appear to hold in our samples. In the USA, there is two-way causality between the variables, but varying directions of effect. In Japan and France, there is no causality between the variables.

In the USA, we discovered that GDP and Unemployment have causation effects on each other at a significant level: a 1% change in GDP leads to approximately negative 6 % change in unemployment. This shows that the Okun's Law of positive GDP change having a negative impact on unemployment holds for USA. As for the unemployment, we found that unemployment had either a positive or a negative impact on GDP in two respective periods. The Engle Granger causality shows that unemployment does cause change in GDP. The low R Square indicates while change in unemployment does explain changes in GDP, while there are other factors that explain the rest of the approximate 70% movement in GDP. With this information we can conclude that there is causation from a change in unemployment on GDP, but the direction of the change is undetermined.

In France and Japan, the results show that the variables have no effect on each other. This shows that any correlation one might gather between the variables is not an indicator of direction or magnitude of change in the other.

Arthur Okun originally observed the effect of unemployment and GDP in the USA. With the data we have obtained up to the current day, it is shown that there is still an effect between the two. GDP does have a negative effect on unemployment, as was hypothesized by Okun, yet the magnitude (6) is larger than was hypothesized (3). Unemployment also was seen to cause GDP, but it was not determined which exact direction, positively or

negatively, it affected GDP since it caused a negative change in time lag 1 but caused a positive change in time lag 2.

With the other two countries, the lack of causality shows that GDP and unemployment have no effect on each other. As we wanted to check Okun's law on countries in different geographical regions, we can see that it does not hold. Although, the geography cannot be a determined reason, it could be from many other factors, it does show that Okun's law does not hold for every country.

Possible reasons of non-causality could be that Japan for instance has a large manufacturing sector which can produce much without increase of employment level: the future scope for employment could be reduced if existing businesses can produce more output using existing labor more intensively and employing additional capital equipment to that end. A highly protected labor market in France may suggest a low reaction of employment to GDP movements and vice versa and hence gives ground to the above statistical results. However, further analysis should be conducted to explain the nonexistence of causality of employment on GDP for France and Japan and vice versa, as detailed in the next section.

7. Further Discussion

To further enhance our current model and conclusions, we would examine Okun's law with additional variables such as labor productivity, average working hours, and size of working population (which are all key components of explaining output growth apart from unemployment).

Also, we employed a long time series in this study but history can actually hide changes in relationships: we can further improve the study by estimating over shorter time series while taking into consideration the various important events in history such as economic crises, significant changes in policies and regulation for example.

The Okun's law was thought of in 1962 and we expect that the relationship between unemployment to output growth should not necessarily hold for all countries due to differences in legal systems, social customs, demographics, usage of IT, tastes, states of business cycle and cultures.

It is worth mentioning that unemployment rates can be largely affected by the labor regulation prevailing in one's country: for instance, heavily regulated labor markets will tend to have higher unemployment whereas lower regulated labor markets will have lower unemployment.

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9. Appendix

Appendix 1 - Regression results for USA

Table 1 - Unit root test for USA

Variable	ADF-test	Critical Value - 5%	Probability MacKinnon (1996) one sided p-values	Conclusion
lnGDPUSA	0.808482	-3.429834	0.9998	I(I)
dlnGDPUSA	-6.613013	-2.874143	0.0000	I(0)
UNEMPUSA	-3.868535	-3.429745	0.0149	I(0)

Since dlnGDPUSA is I(0) and UNEMPUSA is I(0), we use VAR approach

Table 2 - Determining the optimal lag length

Lag	AIC	SC
0	-2.577329	-2.546478
1	-6.119633	-6.027079
2	-6.561869	-6.407613
3	-6.636332	-6.420374
4	-6.707398	**-6.429738***
5	-6.700935	-6.361572
6	-6.711269	-6.310204
7	-6.717207	-6.25444
8	**-6.740157***	-6.215688

Optimal lag lenth is 4 based on SC

UNEMPUSAT(-1)	-0.005835	1.53879	-0.005835	1.53879
	-0.00239	-0.07837		
t-statistic	[-2.44100]	[19.6343]	Significant at 5% level	Significant at 5% level
UNEMPUSA(-2)	0.014896	-0.640932	0.014896	-0.640932
	-0.00426	-0.13982		
t-statistic	[3.49315]	[-4.58396]	Significant at 5% level	Significant at 5% level
UNEMPUSA(-3)	-0.005492	0.167862		
	-0.00435	-0.14248		
t-statistic	[-1.26374]	[1.17813]	Not Significant at 5% level	Not Significant at 5% level
UNEMPUSAT(-4)	-0.00302	-0.106044		
	-0.00248	-0.08143		
t-statistic	[-1.21604]	[-1.30221]	Not Significant at 5% level	Not Significant at 5% level
C	0.000699	0.241758		0.241758
	-0.00277	-0.09082		
t-statistic	[0.25254]	[2.66199]	Not Significant at 5% level	Significant at 5% level

R-squared	0.314252	0.970944
Adj. R-squared	0.288736	0.969863
Sum sq. resids	0.015374	16.52832
S.E. equation	0.008456	0.277265
F-statistic	12.3158	898.0566
Log likelihood	755.8692	-25.90634
Akaike AIC	-6.668475	0.311664
Schwarz SC	-6.5314	0.448739
Mean dependent	0.016015	5.999107
S.D. dependent	0.010027	1.597138

Determinant resid covariance (dof adj.)	3.81E-06
Determinant resid covariance	3.51E-06
Log likelihood	771.1119
Akaike information criterion	-6.724213
Schwarz criterion	-6.450063

Table 6 - Engle Granger causality test

Dependent variable: DLNGDPUSA

Excluded	Chi-sq	df	Prob.
UNEMPUSA	25.56184	4	0
All	25.56184	4	0

Dependent variable: UNEMPUSA

Excluded	Chi-sq	df	Prob.
DLNGDPUSA	9.831726	4	0.0434
All	9.831726	4	0.0434

Table 4 - Engle Granger causality test

Dependent variable: DLNGDPUSA

Excluded	Chi-sq	df	Prob.
UNEMPUSA	25.56184	4	0
All	25.56184	4	0

Dependent variable: UNEMPUSA

Excluded	Chi-sq	df	Prob.
DLNGDPUSA	9.831726	4	0.0434
All	9.831726	4	0.0434

10. Appendix 2 - Regression results for France

Table 1 - Unit root test for France

Variable	ADF-test	Critical Value - 5%	Probability MacKinnon (1996) one sided p-values	Conclusion
lnGDPFRANCe	-2.434247	-3.448681	0.3602	I(I)
dlnGDPUSA	-4.742218	-2.886290	0.0001	I(0)
UNEMPUSA	-3.064003	-3.448681	0.1199	I(I)
dUNEMPUSA	-4.031055	-2.886290	0.0018	I(0)

Table 2 - OLS of the two series - GDP and Unemployment (regression of lnGDPFRANCE on UNEMPFRANCE)

Dependent variable - lnGDPFRANCE

Variable	Coefficient	t-statistic	Probability
Constant (C)	13.50065	50.37220	0.0000
UNEMPFRANCE	0.059801	2.085581	0.0392

Table 3 - Unit root rest of the residual for France

Variable	ADF-test	Critical Value - 5%	Probability MacKinnon (1996) one sided p-values	Conclusion
residual_FRANCE	-2.400196	-3.448681	0.3776	I(I)

Conclusion: Since probability > 0.05, we accept the hypothesis that residual_FRANCE has a unit root. Therefore, GDP and Unemployment for FRANCE are not co-integrated

We use estimate the two log-differencing time series {dlnGDPFRANCE and dUNEMPFRANCE} using the VAR approach

Table 4 - Determining the optimal lag length

Lag	AIC	SC
0	-7.855339	-7.806239
1	**-8.991211***	**-8.843912***
2	-8.988617	-8.743118
3	-8.942059	-8.598362
4	-8.968409	-8.526513
5	-8.989487	-8.449391
6	-8.955846	-8.317551
7	-8.931488	-8.194993
8	-8.889327	-8.054634

Optimal lag lenth is 1

Appendix 3 - Regression results for Japan

Table 1 - Unit root test for Japan

Variable	ADF-test	Critical Value - 5%	Probability MacKinnon (1996) one sided p-values	Conclusion
lnGDPJAPAN	-1.516989	-3.431368	0.8210	I(I)
dlnGDPJAPAN	-3.100604	-2.875330	0.0280	I(0)
UNEMPJAPAN	-2.401129	-3.431471	0.3779	I(I)
dUNEMPJAPAN	-10.32337	-2.875195	0.0000	I(0)

Table 2 - OLS of the two series - GDP and Unemployment (regression of lnGDPJAPAN on UNEMPJAPAN)

Dependent variable - lnGDPJAPAN

Variable	Coefficient	t-statistic	Probability
Constant (C)	17.54558	158.3603	0.0000
UNEMPJAPAN	0.594233	16.3344	0.0000

Table 3 - Unit root rest of the residual for JAPAN

Variable	ADF-test	Critical Value - 5%	Probability MacKinnon (1996) one sided p-values	Conclusion
residual_JAPAN	-2.373105	-3.431471	0.3925	I(I)

Conclusion: Since probability > 0.05, we accept the hypothesis that residual_JAPAN has a unit root.
Therefore, GDP and Unemployment for JAPAN are not co-integrated
We use estimate the two log-differencing time series {dlnGDPJAPAN and dUNEMPJAPAN} using the VAR approach

Table 4 - Determining the optimal lag length

Lag	AIC	SC
0	-6.488567	-6.455812
1	-7.031031	-6.932766
2	-7.232764	**-7.068988***
3	-7.245318	-7.016033
4	-7.24958	-6.954784
5	-7.277654	-6.917348
6	-7.276253	-6.850436
7	-7.269277	-6.77795
8	**-7.327456***	-6.770619

Optimal lag lenth is 2

Table 5 - Vector Autogression Estimates based on lag length of 2

	DLNGDPJAPAN	DUNEMPJAPAN
DLNGDPJAPAN(-1)	0.362899	-0.927761
Probability	-0.0619	-0.50866
t-statistic	[5.86279]	[-1.82392]
DLNGDPJAPAN(-2)	0.441581	0.289478
Probability	-0.06263	-0.51466
t-statistic	[7.05078]	[0.56246]
DUNEMPJAPAN(-1)	0.01051	0.264965
Probability	-0.00859	-0.07062
t-statistic	[1.22310]	[3.75221]
DUNEMPJAPAN(-2)	-0.005022	0.088351
Probability	-0.00856	-0.07032
t-statistic	[-0.58687]	[1.25633]
C	0.002782	0.018544
Probability	-0.00134	-0.01104
t-statistic	[2.06965]	[1.67900]

R-squared	0.522689	0.120012
Adj. R-squared	0.513284	0.102673
Sum sq. resids	0.038416	2.594234
S.E. equation	0.013757	0.113046
F-statistic	55.57483	6.921267
Log likelihood	598.9297	160.8225
Akaike AIC	-5.710862	-1.498293
Schwarz SC	-5.630633	-1.418064
Mean dependent	0.016056	0.012821
S.D. dependent	0.019718	0.119339

Determinant resid covariance (dof adj.)	2.40E-06
Determinant resid covariance	2.28E-06
Log likelihood	760.7231
Akaike information criterion	-7.218491
Schwarz criterion	-7.058033

Table 6 - Engle Granger causality test

Dependent variable: DLNGDPJAPAN

Excluded	Chi-sq	df	Prob.
DUNEMPJAPAN	1.558921	2	0.4587
All	1.558921	2	0.4587

Dependent variable: DUNEMPJAPAN

Excluded	Chi-sq	df	Prob.
DLNGDPJAPAN	3.797792	2	0.1497
All	3.797792	2	0.1497

Appendix 4 - Raw data from OECD for USA from 1955 Q1 to 2012 Q3

USA								
Quarter	GDP [Millions of National Currency]	Unemployment rate [%]	Quarter	GDP [Millions of National Currency]	Unemployment rate [%]	Quarter	GDP [Millions of National Currency]	Unemployment rate [%]
Q1-1955	402,600	4.733333333	Q2-1974	1,484,800	5.200000000	Q3-1993	6,688,300	6.800000000
Q2-1955	410,900	4.400000000	Q3-1974	1,513,700	5.633333333	Q4-1993	6,813,800	6.633333333
Q3-1955	419,400	4.100000000	Q4-1974	1,552,800	6.600000000	Q1-1994	6,916,300	6.566666667
Q4-1955	426,000	4.233333333	Q1-1975	1,569,400	8.266666667	Q2-1994	7,044,300	6.200000000
Q1-1956	428,300	4.033333333	Q2-1975	1,605,000	8.866666667	Q3-1994	7,131,800	6.000000000
Q2-1956	434,200	4.200000000	Q3-1975	1,662,400	8.466666667	Q4-1994	7,248,200	5.633333333
Q3-1956	439,200	4.133333333	Q4-1975	1,713,900	8.300000000	Q1-1995	7,307,700	5.466666667
Q4-1956	448,100	4.133333333	Q1-1976	1,771,900	7.733333333	Q2-1995	7,355,800	5.666666667
Q1-1957	457,200	3.933333333	Q2-1976	1,804,200	7.566666667	Q3-1995	7,452,500	5.666666667
Q2-1957	459,200	4.100000000	Q3-1976	1,837,700	7.733333333	Q4-1995	7,542,500	5.566666667
Q3-1957	466,400	4.233333333	Q4-1976	1,884,500	7.766666667	Q1-1996	7,638,200	5.533333333
Q4-1957	461,500	4.933333333	Q1-1977	1,938,500	7.500000000	Q2-1996	7,800,000	5.500000000
Q1-1958	453,900	6.300000000	Q2-1977	2,005,200	7.133333333	Q3-1996	7,892,700	5.266666667
Q2-1958	458,000	7.366666667	Q3-1977	2,066,000	6.900000000	Q4-1996	8,023,000	5.333333333
Q3-1958	471,700	7.333333333	Q4-1977	2,110,800	6.666666667	Q1-1997	8,137,000	5.233333333
Q4-1958	485,000	6.366666667	Q1-1978	2,149,100	6.333333333	Q2-1997	8,276,800	5.000000000
Q1-1959	495,500	5.833333333	Q2-1978	2,274,700	6.000000000	Q3-1997	8,409,900	4.866666667
Q2-1959	508,500	5.100000000	Q3-1978	2,335,200	6.033333333	Q4-1997	8,505,700	4.666666667
Q3-1959	509,300	5.266666667	Q4-1978	2,416,000	5.900000000	Q1-1998	8,600,600	4.633333333
Q4-1959	513,200	5.600000000	Q1-1979	2,463,300	5.866666667	Q2-1998	8,698,600	4.400000000
Q1-1960	527,000	5.133333333	Q2-1979	2,526,400	5.700000000	Q3-1998	8,847,200	4.533333333
Q2-1960	526,200	5.233333333	Q3-1979	2,599,700	5.866666667	Q4-1998	9,027,500	4.433333333
Q3-1960	529,000	5.533333333	Q4-1979	2,659,400	5.966666667	Q1-1999	9,148,600	4.300000000
Q4-1960	523,700	6.266666667	Q1-1980	2,724,100	6.300000000	Q2-1999	9,252,600	4.266666667
Q1-1961	528,000	6.800000000	Q2-1980	2,728,000	7.333333333	Q3-1999	9,405,100	4.233333333
Q2-1961	539,000	7.000000000	Q3-1980	2,785,200	7.666666667	Q4-1999	9,607,700	4.066666667
Q3-1961	549,500	6.766666667	Q4-1980	2,915,300	7.400000000	Q1-2000	9,709,500	4.033333333
Q4-1961	562,600	6.200000000	Q1-1981	3,051,400	7.433333333	Q2-2000	9,949,100	3.933333333
Q1-1962	576,100	5.633333333	Q2-1981	3,084,300	7.400000000	Q3-2000	10,017,500	4.000000000
Q2-1962	583,200	5.533333333	Q3-1981	3,177,000	7.400000000	Q4-2000	10,129,800	3.900000000
Q3-1962	590,000	5.566666667	Q4-1981	3,194,700	8.233333333	Q1-2001	10,165,100	4.233333333
Q4-1962	593,300	5.533333333	Q1-1982	3,184,900	8.833333333	Q2-2001	10,301,300	4.400000000
Q1-1963	602,500	5.766666667	Q2-1982	3,240,900	9.433333333	Q3-2001	10,305,200	4.833333333
Q2-1963	611,200	5.733333333	Q3-1982	3,274,400	9.900000000	Q4-2001	10,373,100	5.500000000
Q3-1963	623,900	5.500000000	Q4-1982	3,312,500	10.666666670	Q1-2002	10,498,700	5.700000000
Q4-1963	633,500	5.566666667	Q1-1983	3,381,000	10.366666670	Q2-2002	10,601,900	5.833333333
Q1-1964	649,600	5.466666667	Q2-1983	3,482,200	10.133333330	Q3-2002	10,701,700	5.733333333
Q2-1964	658,900	5.200000000	Q3-1983	3,587,100	9.366666667	Q4-2002	10,766,900	5.866666667
Q3-1964	670,500	5.000000000	Q4-1983	3,688,100	8.533333333	Q1-2003	10,887,400	5.866666667
Q4-1964	675,600	4.966666667	Q1-1984	3,807,400	7.866666667	Q2-2003	11,011,600	6.133333333
Q1-1965	695,700	4.900000000	Q2-1984	3,906,300	7.433333333	Q3-2003	11,255,100	6.133333333
Q2-1965	708,100	4.666666667	Q3-1984	3,976,000	7.433333333	Q4-2003	11,414,800	5.833333333
Q3-1965	725,200	4.366666667	Q4-1984	4,034,000	7.300000000	Q1-2004	11,589,900	5.700000000
Q4-1965	747,500	4.100000000	Q1-1985	4,117,200	7.233333333	Q2-2004	11,762,900	5.600000000
Q1-1966	770,800	3.866666667	Q2-1985	4,175,700	7.300000000	Q3-2004	11,936,300	5.433333333
Q2-1966	779,900	3.833333333	Q3-1985	4,258,300	7.200000000	Q4-2004	12,123,900	5.433333333
Q3-1966	793,100	3.766666667	Q4-1985	4,318,700	7.033333333	Q1-2005	12,361,800	5.300000000
Q4-1966	806,900	3.700000000	Q1-1986	4,382,400	7.033333333	Q2-2005	12,500,000	5.100000000
Q1-1967	817,800	3.833333333	Q2-1986	4,423,200	7.166666667	Q3-2005	12,728,600	4.966666667
Q2-1967	822,300	3.833333333	Q3-1986	4,491,300	6.966666667	Q4-2005	12,901,400	4.966666667
Q3-1967	837,000	3.800000000	Q4-1986	4,543,300	6.833333333	Q1-2006	13,161,400	4.733333333
Q4-1967	852,700	3.900000000	Q1-1987	4,611,100	6.600000000	Q2-2006	13,330,400	4.633333333
Q1-1968	879,800	3.733333333	Q2-1987	4,686,700	6.266666667	Q3-2006	13,432,800	4.633333333
Q2-1968	904,100	3.566666667	Q3-1987	4,764,500	6.000000000	Q4-2006	13,584,200	4.433333333
Q3-1968	919,300	3.533333333	Q4-1987	4,883,100	5.833333333	Q1-2007	13,758,500	4.500000000
Q4-1968	936,200	3.400000000	Q1-1988	4,948,600	5.700000000	Q2-2007	13,976,800	4.500000000
Q1-1969	960,900	3.400000000	Q2-1988	5,059,300	5.466666667	Q3-2007	14,126,200	4.666666667
Q2-1969	976,100	3.433333333	Q3-1988	5,142,800	5.466666667	Q4-2007	14,253,200	4.800000000
Q3-1969	996,300	3.566666667	Q4-1988	5,251,000	5.333333333	Q1-2008	14,273,900	5.000000000
Q4-1969	1,004,500	3.566666667	Q1-1989	5,360,300	5.200000000	Q2-2008	14,415,500	5.333333333
Q1-1970	1,017,100	4.166666667	Q2-1989	5,453,600	5.233333333	Q3-2008	14,395,100	6.000000000
Q2-1970	1,033,100	4.766666667	Q3-1989	5,532,900	5.233333333	Q4-2008	14,081,700	6.866666667
Q3-1970	1,050,500	5.166666667	Q4-1989	5,581,700	5.366666667	Q1-2009	13,923,400	8.266666667
Q4-1970	1,052,700	5.833333333	Q1-1990	5,708,100	5.300000000	Q2-2009	13,885,400	9.266666667
Q1-1971	1,098,100	5.933333333	Q2-1990	5,797,400	5.333333333	Q3-2009	13,952,200	9.633333333
Q2-1971	1,118,800	5.900000000	Q3-1990	5,850,600	5.700000000	Q4-2009	14,133,600	9.933333333
Q3-1971	1,139,100	6.033333333	Q4-1990	5,846,000	6.133333333	Q1-2010	14,270,300	9.766666667
Q4-1971	1,151,400	5.933333333	Q1-1991	5,880,200	6.600000000	Q2-2010	14,413,500	9.633333333
Q1-1972	1,190,100	5.766666667	Q2-1991	5,962,000	6.833333333	Q3-2010	14,576,000	9.533333333
Q2-1972	1,225,600	5.700000000	Q3-1991	6,033,700	6.866666667	Q4-2010	14,735,900	9.566666667
Q3-1972	1,249,300	5.566666667	Q4-1991	6,092,500	7.100000000	Q1-2011	14,814,900	9.000000000
Q4-1972	1,286,600	5.366666667	Q1-1992	6,190,700	7.366666667	Q2-2011	15,003,600	9.033333333
Q1-1973	1,335,100	4.933333333	Q2-1992	6,295,200	7.600000000	Q3-2011	15,163,200	9.066666667
Q2-1973	1,371,500	4.933333333	Q3-1992	6,389,700	7.633333333	Q4-2011	15,321,000	8.700000000
Q3-1973	1,390,700	4.800000000	Q4-1992	6,493,600	7.366666667	Q1-2012	15,478,300	8.266666667
Q4-1973	1,431,800	4.766666667	Q1-1993	6,544,500	7.133333333	Q2-2012	15,585,600	8.166666667
Q1-1974	1,446,500	5.133333333	Q2-1993	6,622,700	7.066666667	Q3-2012	15,775,700	8.066666667

Appendix 5 - Raw data from OECD for FRANCE from 1983 Q 1 to 2012 Q 3

FRANCE					
Quarter	GDP [Millions of National Currency]	Unemployment rate [%]	Quarter	GDP [Millions of National Currency]	Unemployment rate [%]
Q1-1983	614,196	6.900000000	Q1-1998	1,303,952	10.866666670
Q2-1983	631,032	6.933333333	Q2-1998	1,320,132	10.733333330
Q3-1983	647,984	7.200000000	Q3-1998	1,326,548	10.700000000
Q4-1983	661,980	7.566666667	Q4-1998	1,335,568	10.700000000
Q1-1984	679,060	8.100000000	Q1-1999	1,343,868	10.766666670
Q2-1984	689,724	8.500000000	Q2-1999	1,356,884	10.600000000
Q3-1984	702,960	8.666666667	Q3-1999	1,372,404	10.266666670
Q4-1984	709,420	8.833333333	Q4-1999	1,391,336	9.866666667
Q1-1985	722,980	8.900000000	Q1-2000	1,416,816	9.500000000
Q2-1985	740,144	8.933333333	Q2-2000	1,432,060	9.100000000
Q3-1985	752,164	9.000000000	Q3-2000	1,447,636	8.866666667
Q4-1985	765,304	9.000000000	Q4-2000	1,466,768	8.566666667
Q1-1986	780,652	8.933333333	Q1-2001	1,480,932	8.266666667
Q2-1986	796,904	9.066666667	Q2-2001	1,493,052	8.133333333
Q3-1986	810,208	9.133333333	Q3-2001	1,504,252	8.100000000
Q4-1986	816,036	9.233333333	Q4-2001	1,507,416	8.200000000
Q1-1987	820,104	9.366666667	Q1-2002	1,525,736	8.000000000
Q2-1987	833,896	9.366666667	Q2-2002	1,538,648	8.200000000
Q3-1987	845,784	9.200000000	Q3-2002	1,551,312	8.433333333
Q4-1987	864,880	9.133333333	Q4-2002	1,559,684	8.600000000
Q1-1988	883,344	9.033333333	Q1-2003	1,569,620	8.633333333
Q2-1988	897,100	8.833333333	Q2-2003	1,577,460	8.866666667
Q3-1988	915,932	8.800000000	Q3-2003	1,595,408	8.866666667
Q4-1988	935,440	8.666666667	Q4-2003	1,613,432	9.166666667
Q1-1989	955,804	8.533333333	Q1-2004	1,628,452	9.300000000
Q2-1989	971,348	8.400000000	Q2-2004	1,644,772	9.200000000
Q3-1989	986,692	8.300000000	Q3-2004	1,658,336	9.266666667
Q4-1989	1,005,220	8.200000000	Q4-2004	1,681,188	9.266666667
Q1-1990	1,020,852	8.100000000	Q1-2005	1,692,180	9.100000000
Q2-1990	1,031,020	8.000000000	Q2-2005	1,705,628	9.200000000
Q3-1990	1,037,788	7.933333333	Q3-2005	1,720,436	9.366666667
Q4-1990	1,043,012	8.000000000	Q4-2005	1,746,132	9.500000000
Q1-1991	1,051,216	8.033333333	Q1-2006	1,765,360	9.500000000
Q2-1991	1,068,716	8.300000000	Q2-2006	1,790,944	9.366666667
Q3-1991	1,078,672	8.600000000	Q3-2006	1,804,796	9.233333333
Q4-1991	1,089,204	8.800000000	Q4-2006	1,836,260	8.900000000
Q1-1992	1,104,888	9.000000000	Q1-2007	1,857,804	8.766666667
Q2-1992	1,105,700	9.200000000	Q2-2007	1,877,656	8.500000000
Q3-1992	1,109,728	9.433333333	Q3-2007	1,898,196	8.300000000
Q4-1992	1,108,856	9.700000000	Q4-2007	1,915,864	7.900000000
Q1-1993	1,111,280	10.000000000	Q1-2008	1,938,784	7.533333333
Q2-1993	1,116,332	10.400000000	Q2-2008	1,934,472	7.700000000
Q3-1993	1,122,240	10.800000000	Q3-2008	1,933,504	7.833333333
Q4-1993	1,128,544	11.066666670	Q4-2008	1,920,172	8.200000000
Q1-1994	1,136,248	11.233333330	Q1-2009	1,887,172	8.900000000
Q2-1994	1,152,512	11.266666670	Q2-2009	1,879,696	9.466666667
Q3-1994	1,161,668	11.100000000	Q3-2009	1,881,480	9.600000000
Q4-1994	1,176,532	10.800000000	Q4-2009	1,896,096	9.966666667
Q1-1995	1,184,764	10.566666670	Q1-2010	1,910,924	9.900000000
Q2-1995	1,193,992	10.533333330	Q2-2010	1,928,572	9.700000000
Q3-1995	1,200,888	10.366666670	Q3-2010	1,946,632	9.666666667
Q4-1995	1,206,672	10.633333330	Q4-2010	1,957,828	9.666666667
Q1-1996	1,219,044	10.900000000	Q1-2011	1,981,276	9.600000000
Q2-1996	1,223,780	10.900000000	Q2-2011	1,989,364	9.600000000
Q3-1996	1,231,112	10.966666670	Q3-2011	2,000,492	9.600000000
Q4-1996	1,233,272	11.033333330	Q4-2011	2,010,592	9.766666667
Q1-1997	1,242,672	11.233333330	Q1-2012	2,016,132	10.000000000
Q2-1997	1,258,068	11.200000000	Q2-2012	2,025,908	10.266666670
Q3-1997	1,270,488	11.133333330	Q3-2012	2,038,568	10.700000000
Q4-1997	1,288,124	11.000000000			

Appendix 6 - Raw data from OECD for JAPAN from 1960 Q 1 to 2012 Q3

JAPAN								
Quarter	GDP [Millions of National Currency]	Unemployment rate [%]	Quarter	GDP [Millions of National Currency]	Unemployment rate [%]	Quarter	GDP [Millions of National Currency]	Unemployment rate [%]
Q1-1960	15,549,191	1.766666667	Q4-1977	196,902,817	2.000000000	Q3-1995	504,785,500	3.166666667
Q2-1960	15,756,762	1.666666667	Q1-1978	202,890,186	2.166666667	Q4-1995	505,200,400	3.333333333
Q3-1960	16,654,119	1.566666667	Q2-1978	206,791,482	2.266666667	Q1-1996	506,644,300	3.366666667
Q4-1960	17,460,817	1.466666667	Q3-1978	212,164,751	2.300000000	Q2-1996	511,811,800	3.400000000
Q1-1961	18,417,553	1.433333333	Q4-1978	216,170,757	2.200000000	Q3-1996	511,793,300	3.333333333
Q2-1961	19,172,871	1.466666667	Q1-1979	220,537,038	2.100000000	Q4-1996	518,248,600	3.366666667
Q3-1961	19,920,292	1.433333333	Q2-1979	225,494,138	2.033333333	Q1-1997	522,125,700	3.333333333
Q4-1961	21,434,312	1.433333333	Q3-1979	228,917,939	2.133333333	Q2-1997	523,481,000	3.333333333
Q1-1962	21,975,188	1.300000000	Q4-1979	232,316,510	2.066666667	Q3-1997	523,981,400	3.433333333
Q2-1962	22,325,413	1.300000000	Q1-1980	236,367,024	1.900000000	Q4-1997	524,552,900	3.500000000
Q3-1962	22,466,631	1.233333333	Q2-1980	241,174,504	1.966666667	Q1-1998	514,034,200	3.666666667
Q4-1962	22,984,432	1.333333333	Q3-1980	248,997,868	2.033333333	Q2-1998	510,589,500	4.066666667
Q1-1963	23,741,903	1.400000000	Q4-1980	257,143,481	2.166666667	Q3-1998	510,483,200	4.266666667
Q2-1963	25,113,885	1.200000000	Q1-1981	259,587,692	2.200000000	Q4-1998	513,700,300	4.400000000
Q3-1963	26,224,351	1.200000000	Q2-1981	264,089,963	2.266666667	Q1-1999	506,806,200	4.600000000
Q4-1963	27,553,874	1.233333333	Q3-1981	264,936,719	2.166666667	Q2-1999	506,745,700	4.733333333
Q1-1964	28,646,393	1.233333333	Q4-1981	269,482,098	2.200000000	Q3-1999	503,511,900	4.700000000
Q2-1964	29,984,327	1.166666667	Q1-1982	275,023,237	2.233333333	Q4-1999	504,332,000	4.633333333
Q3-1964	30,668,676	1.166666667	Q2-1982	276,506,987	2.333333333	Q1-2000	511,596,600	4.833333333
Q4-1964	31,505,526	1.100000000	Q3-1982	278,338,143	2.366666667	Q2-2000	510,311,500	4.700000000
Q1-1965	32,509,232	1.133333333	Q4-1982	281,797,994	2.466666667	Q3-2000	508,162,200	4.666666667
Q2-1965	33,265,780	1.233333333	Q1-1983	283,880,194	2.666666667	Q4-2000	510,617,500	4.733333333
Q3-1965	34,330,404	1.266666667	Q2-1983	286,953,285	2.666666667	Q1-2001	514,323,900	4.766666667
Q4-1965	34,415,422	1.300000000	Q3-1983	290,858,526	2.700000000	Q2-2001	508,702,000	4.900000000
Q1-1966	36,458,832	1.366666667	Q4-1983	294,324,971	2.600000000	Q3-2001	501,054,200	5.133333333
Q2-1966	38,668,995	1.333333333	Q1-1984	299,474,582	2.700000000	Q4-2001	498,973,300	5.366666667
Q3-1966	40,143,942	1.300000000	Q2-1984	305,988,963	2.733333333	Q1-2002	499,072,600	5.266666667
Q4-1966	41,055,759	1.266666667	Q3-1984	310,779,402	2.733333333	Q2-2002	498,463,500	5.400000000
Q1-1967	43,149,420	1.300000000	Q4-1984	313,433,680	2.666666667	Q3-2002	499,677,500	5.433333333
Q2-1967	44,401,105	1.266666667	Q1-1985	321,223,672	2.566666667	Q4-2002	500,050,000	5.333333333
Q3-1967	46,709,926	1.166666667	Q2-1985	327,803,781	2.566666667	Q1-2003	494,130,900	5.333333333
Q4-1967	48,754,361	1.266666667	Q3-1985	332,263,450	2.600000000	Q2-2003	500,479,900	5.433333333
Q1-1968	50,567,124	1.266666667	Q4-1985	338,218,027	2.766666667	Q3-2003	500,306,600	5.166666667
Q2-1968	52,602,944	1.166666667	Q1-1986	341,426,530	2.666666667	Q4-2003	501,513,000	5.033333333
Q3-1968	54,592,820	1.200000000	Q2-1986	344,097,138	2.766666667	Q1-2004	505,660,900	4.900000000
Q4-1968	58,987,099	1.066666667	Q3-1986	346,821,708	2.833333333	Q2-2004	503,546,700	4.733333333
Q1-1969	59,103,909	1.133333333	Q4-1986	349,140,651	2.800000000	Q3-2004	503,540,700	4.766666667
Q2-1969	62,153,383	1.200000000	Q1-1987	348,081,901	2.933333333	Q4-2004	502,618,100	4.533333333
Q3-1969	64,693,569	1.133333333	Q2-1987	354,193,089	3.000000000	Q1-2005	501,045,500	4.533333333
Q4-1969	68,502,771	1.066666667	Q3-1987	362,183,004	2.766666667	Q2-2005	505,294,400	4.433333333
Q1-1970	71,303,755	1.066666667	Q4-1987	371,067,044	2.700000000	Q3-2005	504,882,100	4.300000000
Q2-1970	73,570,529	1.133333333	Q1-1988	380,745,703	2.666666667	Q4-2005	504,852,900	4.433333333
Q3-1970	76,687,484	1.233333333	Q2-1988	379,748,828	2.466666667	Q1-2006	505,439,500	4.200000000
Q4-1970	78,479,736	1.266666667	Q3-1988	389,351,109	2.533333333	Q2-2006	505,625,700	4.133333333
Q1-1971	79,831,104	1.166666667	Q4-1988	394,927,546	2.400000000	Q3-2006	504,301,100	4.100000000
Q2-1971	81,587,462	1.200000000	Q1-1989	408,101,863	2.333333333	Q4-2006	511,534,300	4.033333333
Q3-1971	83,785,217	1.233333333	Q2-1989	406,598,638	2.300000000	Q1-2007	514,027,200	4.000000000
Q4-1971	85,183,965	1.333333333	Q3-1989	416,229,726	2.200000000	Q2-2007	514,580,200	3.733333333
Q1-1972	89,342,674	1.400000000	Q4-1989	431,545,987	2.166666667	Q3-2007	510,185,400	3.733333333
Q2-1972	92,023,361	1.400000000	Q1-1990	431,437,353	2.133333333	Q4-2007	512,965,100	3.866666667
Q3-1972	96,184,634	1.433333333	Q2-1990	447,491,127	2.133333333	Q1-2008	513,557,200	3.933333333
Q4-1972	100,254,326	1.400000000	Q3-1990	456,061,031	2.066666667	Q2-2008	505,546,000	3.933333333
Q1-1973	107,239,556	1.233333333	Q4-1990	460,357,293	2.066666667	Q3-2008	496,533,900	3.966666667
Q2-1973	112,112,151	1.366666667	Q1-1991	467,578,555	2.100000000	Q4-2008	488,664,000	4.066666667
Q3-1973	116,418,848	1.266666667	Q2-1991	475,826,513	2.100000000	Q1-2009	468,119,700	4.600000000
Q4-1973	123,497,094	1.133333333	Q3-1991	476,606,729	2.100000000	Q2-2009	472,303,900	5.100000000
Q1-1974	126,432,527	1.300000000	Q4-1991	483,799,793	2.066666667	Q3-2009	469,530,700	5.400000000
Q2-1974	135,101,916	1.300000000	Q1-1992	484,967,886	2.066666667	Q4-2009	474,361,900	5.200000000
Q3-1974	141,413,153	1.400000000	Q2-1992	489,635,795	2.100000000	Q1-2010	479,058,700	5.066666667
Q4-1974	145,230,867	1.600000000	Q3-1992	489,658,719	2.166666667	Q2-2010	482,632,100	5.100000000
Q1-1975	145,512,278	1.766666667	Q4-1992	487,323,852	2.266666667	Q3-2010	484,851,300	5.033333333
Q2-1975	150,186,122	1.800000000	Q1-1993	494,406,557	2.300000000	Q4-2010	480,998,800	5.000000000
Q3-1975	153,577,412	1.900000000	Q2-1993	489,134,315	2.433333333	Q1-2011	469,423,800	4.766666667
Q4-1975	158,024,609	2.100000000	Q3-1993	487,864,181	2.533333333	Q2-2011	462,649,000	4.666666667
Q1-1976	163,372,752	2.033333333	Q4-1993	491,298,573	2.733333333	Q3-2011	472,142,100	4.433333333
Q2-1976	168,750,739	2.066666667	Q1-1994	495,078,200	2.866666667	Q4-2011	469,247,300	4.466666667
Q3-1976	173,854,801	2.000000000	Q2-1994	492,416,200	2.800000000	Q1-2012	475,642,900	4.533333333
Q4-1976	176,416,934	1.933333333	Q3-1994	500,154,300	2.966666667	Q2-2012	474,102,900	4.433333333
Q1-1977	183,985,701	1.966666667	Q4-1994	495,322,700	2.933333333	Q3-2012	469,793,500	4.233333333
Q2-1977	187,889,254	2.033333333	Q1-1995	495,185,500	3.033333333			
Q3-1977	191,943,358	2.033333333	Q2-1995	501,233,400	3.066666667			

11.Abbreviations

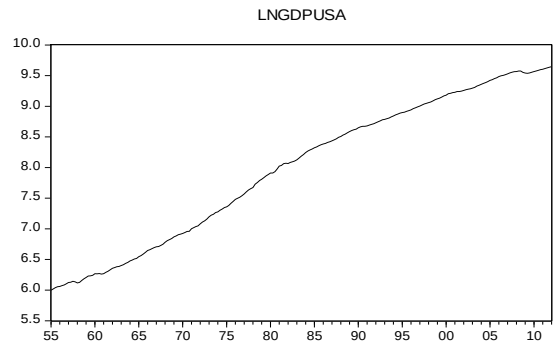
lnGDPUSA	Natural Logarithm form of GDP absolute values in U.S.A. denominated in millions of U.S. dollars
dlnGDPUSA	The First Difference of lnGDPUSA
UNEMPUSA	Harmonised unemployment rates in U.S.A.
dUNEMPUSA	The First Difference of the Harmonised unemployment rates in U.S.A
lnGDPFRANCE	Natural Logarithm form of GDP absolute values in France denominated in millions of U.S. dollars
dlnGDPFRANCE	The First Difference of lnGDPFRANCE
UNEMPFRANCE	Harmonised unemployment rates in France
dUNEMPFRANCE	The First Difference of the Harmonised unemployment rates in France
lnGDPJAPAN	Natural Logarithm form of GDP absolute values in Japan denominated in millions of U.S. dollars
dlnGDPJAPAN	The First Difference of lnGDPJAPAN
UNEMPJAPAN	Harmonised unemployment rates in Japan
dUNEMPJAPAN	The First Difference of the Harmonised unemployment rates in Japan
VAR	Vector Auto-regression
ECM	Error Correction Model
AIC	Akaike Information Criterion
SIC	Schwarz Information Criteria
HP	The HP trend of a variable captures not only the variable's constant growth rate but also slow-moving fluctuations. The HP trend is obtained by applying the Hodrick-Prescott (HP) filter.

12.Graphs

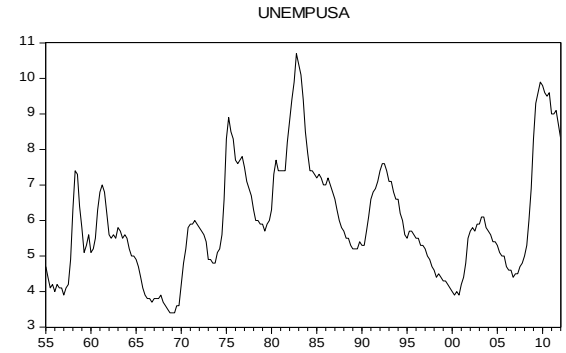
USA

USA

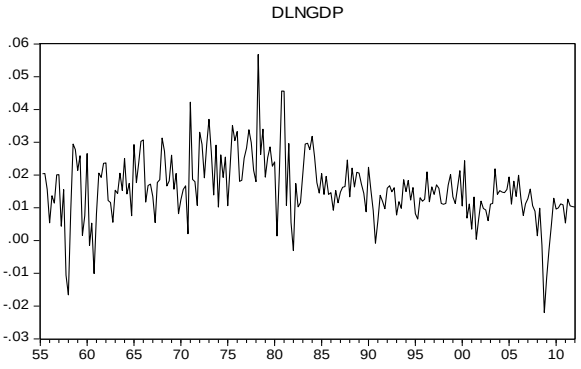
lnGDPUSA



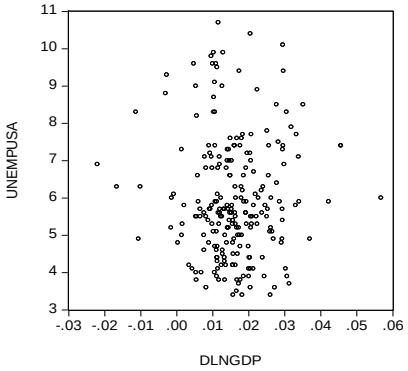
UNEMPUSA



dlnGDPUSA



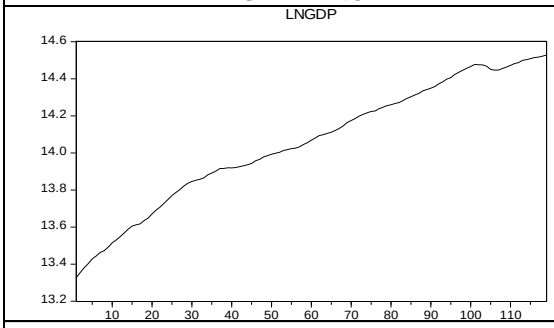
UNEMPUSA and dLNGDPUSA scatter diagram



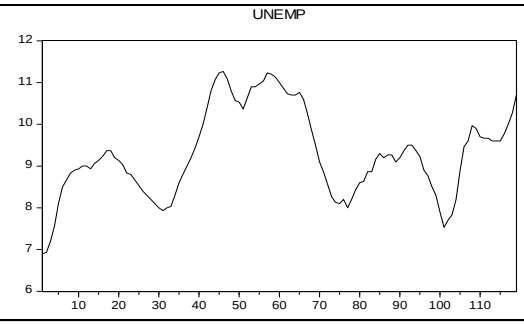
FRANCE

FRANCE

lnGDPFRANCE



UNEMPFRANCE



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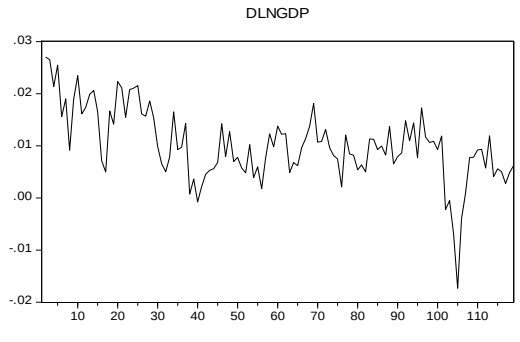

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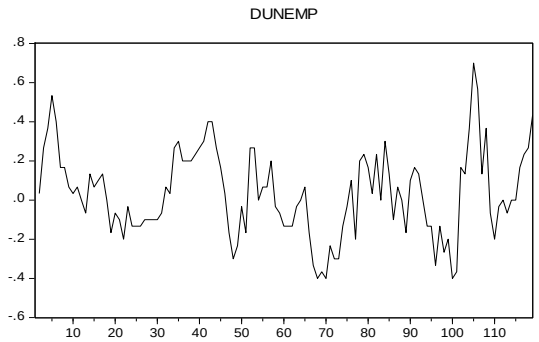
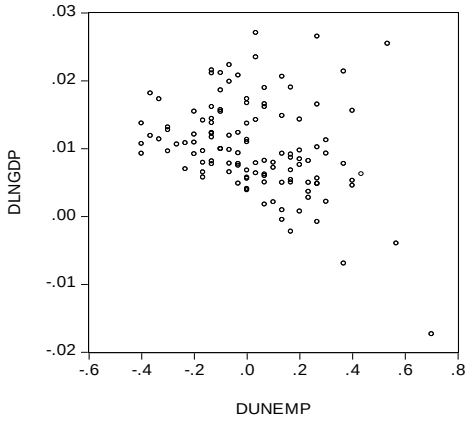


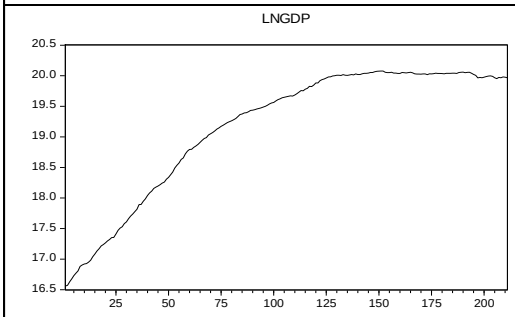
UNEMPUSA and dLNGDPUSA scatter diagram



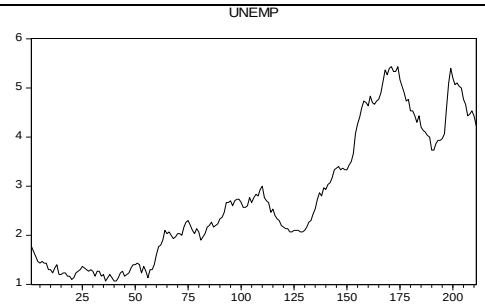
JAPAN

JAPAN

lnGDPJAPAN



UNEMPJAPAN



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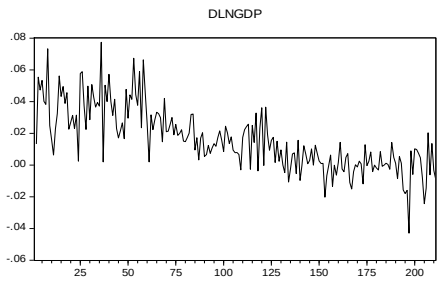
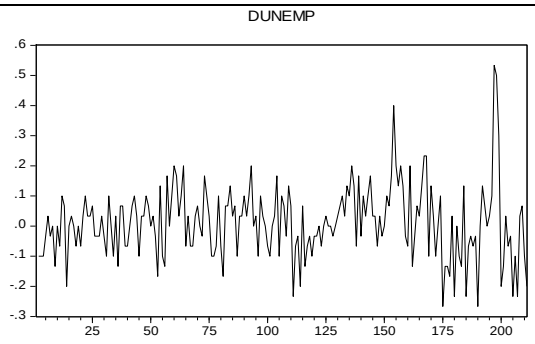


dUNEMPJAPAN



UNEMPJAPAN and dLNGDPJAPAN scatter diagram