Documento de Trabajo

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THE INTERRELATIONSHIP AMONG THE INTERNATIONAL STOCK MARKETS

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Without doubt from an economic point of view, the stock markets of the principal countries are more and more related among them. Though this affirmation has more clearly arisen as a truth from the October 1987 crash, initially one of the most surprising things was the strange similarity among the behaviour of the main stock markets of the world since that date. It was said that if in New York the big investors sold their stocks (and, for this reason, their price would go down) they should reinvest the money obtained in that operation in others markets, and this last should rise their prices. But, surprisingly, nothing of this seems to have occurred, and the principal markets in the world behaved as one, although following the path pointed out by Wall Street.

All shown in the previous paragraph induced us to study the present correlation between a series of returns that is made up by six stock markets (NYSE - Wall Street - Tokyo, London, Paris, Francfurt and Madrid), during the last three-months of the year 1987, trying to know the present relation among them.

In that way, first of all, we must define the severals stock exchange indices we have used in our study; they are summarized in figure 1. This figure shows the indices we have used to calculate the returns, the number of different stocks that made it up, if it is weighted or not, the base year (the date base is a 1 of January of the year shown in the figure) and the formula used in its calculation. The base value is 100 for all of them (the Tokyo data is unknown).

Before we calculate the returns in figures 2, 3, 4 and 5 the indices evolution in the markets, previously mentioned, are shown for the period considered, with the object of analysing the similarities between their charts.

S. Exchange	Index	Stocks	Wght	Base	Formula
NYSE	Dow Jones IA	30	NO	1887	Arithmetic Average
London	FT-30	30	NO	1935	Geometric Average
Paris	Agefi	162	YES	1962	—
Francfurt	Frankfurter Alg. Zeitung	100	YES	1959	Paasche
Tokyo	Nikkei	—	—	—	—
Madrid	Diary index	74	YES	1986	Laspeyres

Fig.1

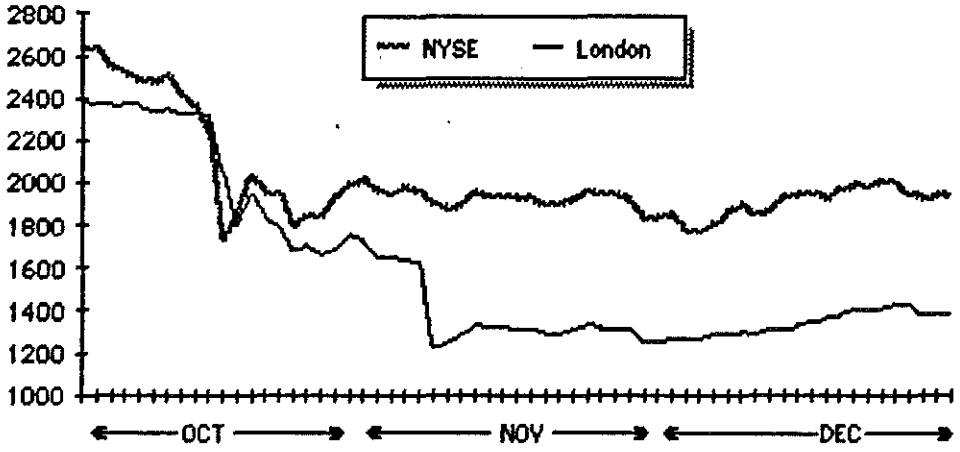

Fig.2

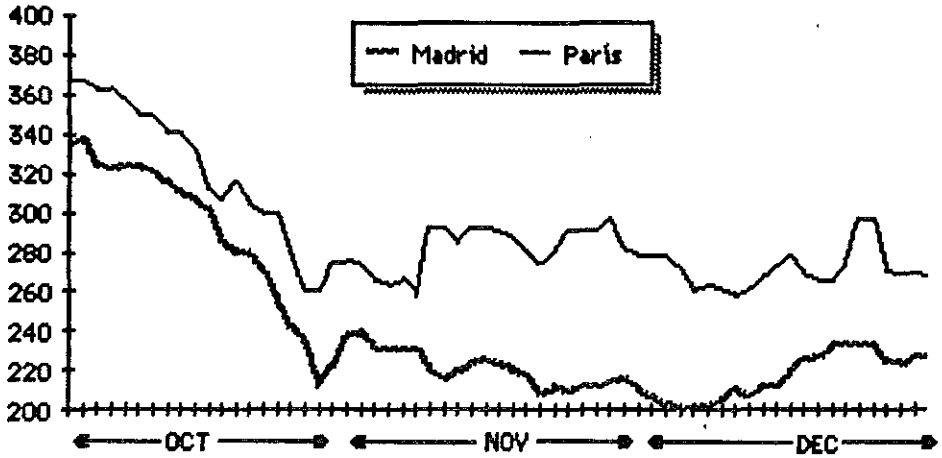

Fig.3

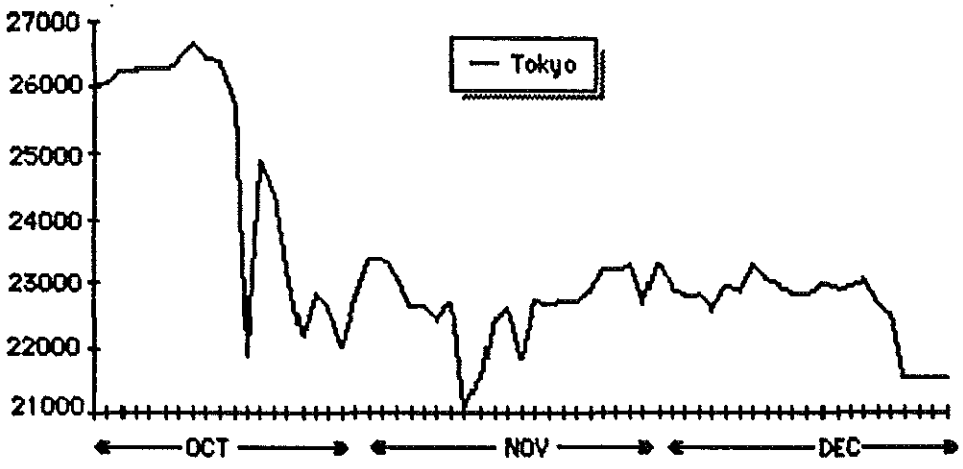

Fig.4

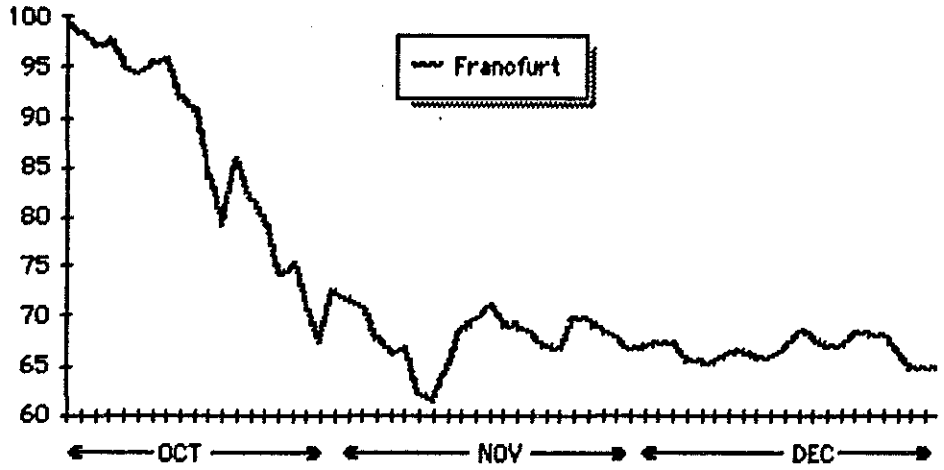

Fig.5

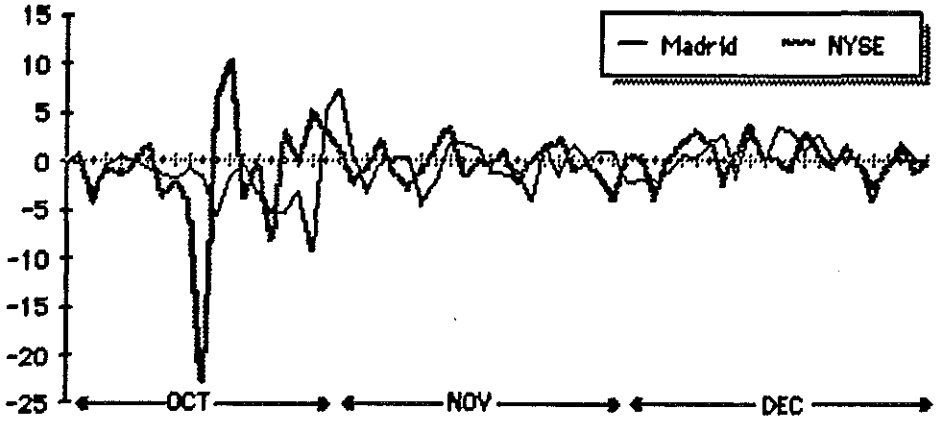

Fig.6

The indices have been grouped in the previous figures in base to the similar values that they had in the last quarter of 1987. It can be observed similarity between the charts of them, with the exception of the Nippon Keisai that suffers some oscillations really strongs.

The next step is to calculate the returns of the indices commented before with the object of comparing their behaviours using a homogeneous quantity. In this way, we will use the next expression:

$$R_i = \frac{I_i - I_{i-1}}{I_{i-1}}$$

That is, the return of any day i (R_i) is equal to the difference between the index value the same day (I_i) minus the value of the day before (I_{i-1}) and dividing, the result, by the latter.

In figures 6 and 7, the New York and London market returns are shown (figure 6) as well as New York and Tokyo (figure 7) during the period considerated. In the first of them we can observe the melt down suffered in the mid October by Wall Street and the one suffered at the beginning of the November by London. While in figure 7 it is shown how Tokyo held up better the New York disaster, approximating the X axis, that is, the zero return.

As the previous figures don't show clearly what occurred with the large October oscillations, figures 8 and 9 show the returns evolution during that month. In figure 8 we can see the New York, Tokyo and London returns, that is, the three main world stock markets; we can observe on the 19th., Tokyo goes down a 3% only (it is the first of them to open), London goes down a 11% (forseeing in some way the North American melt down, since both markets coincide some hours) and New York goes down 508 points, a 22%. The next day Tokyo pushed down by Wall Street loses a 15%, London a 12%, while the american market goes up a 6%, beginning a series of strong oscillations aimed to stabilize the situation.

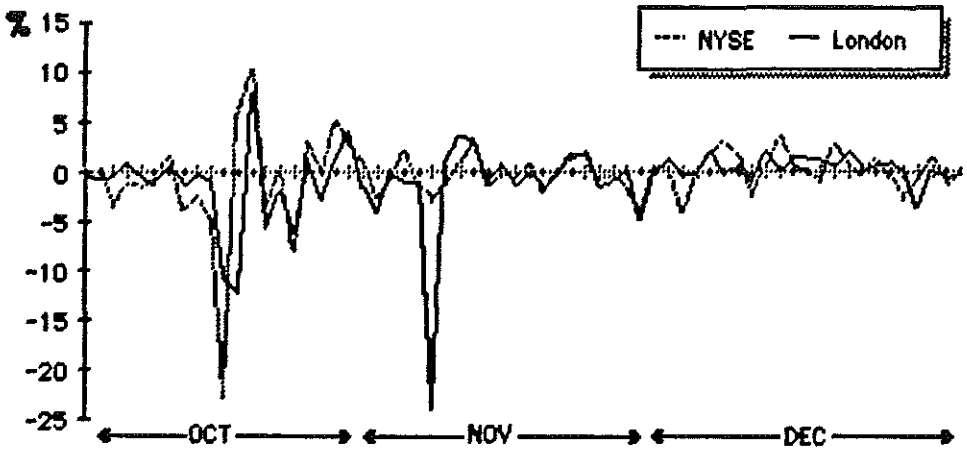

Fig.6

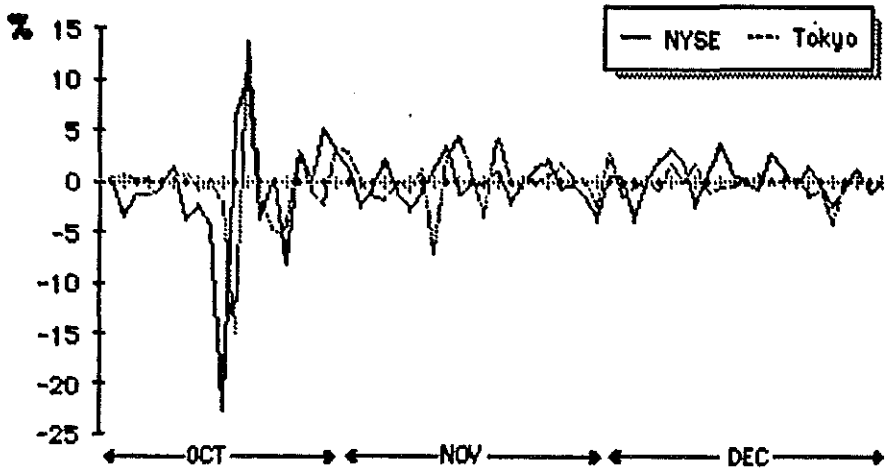

Fig.7

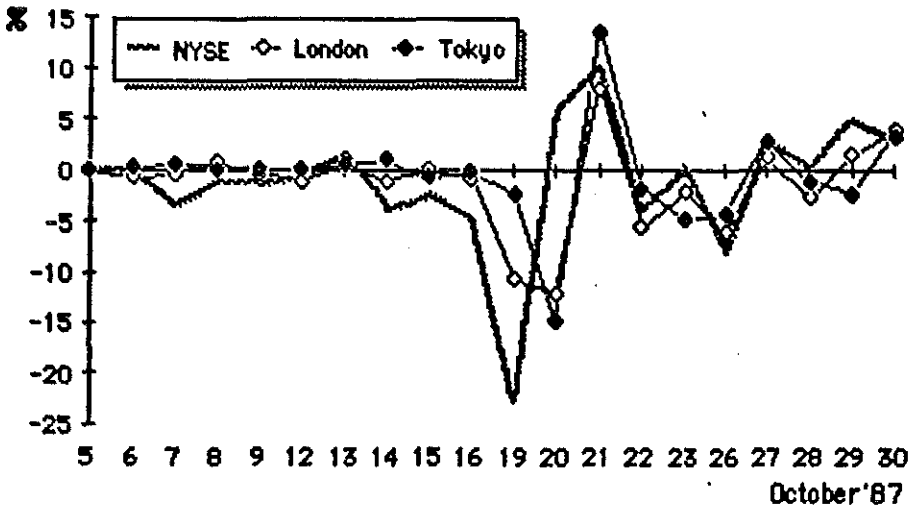

Fig.8

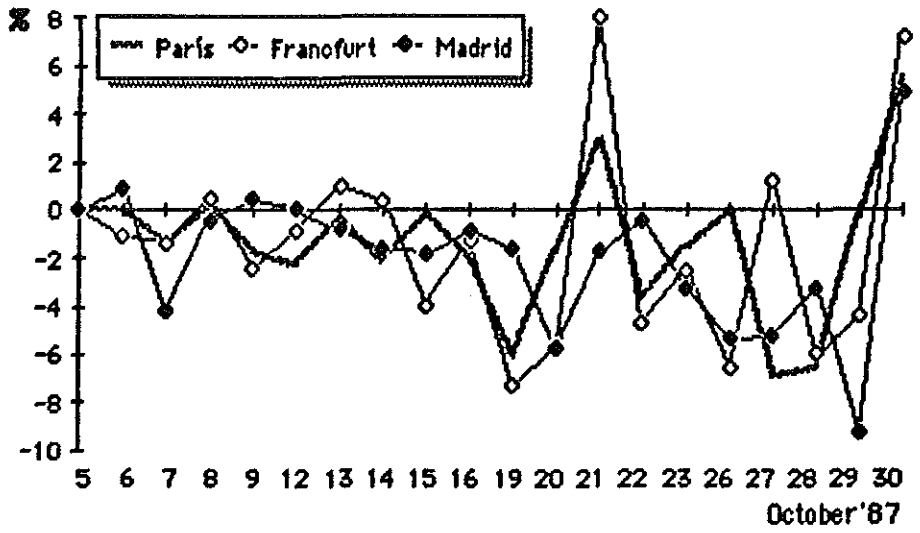

Fig.9

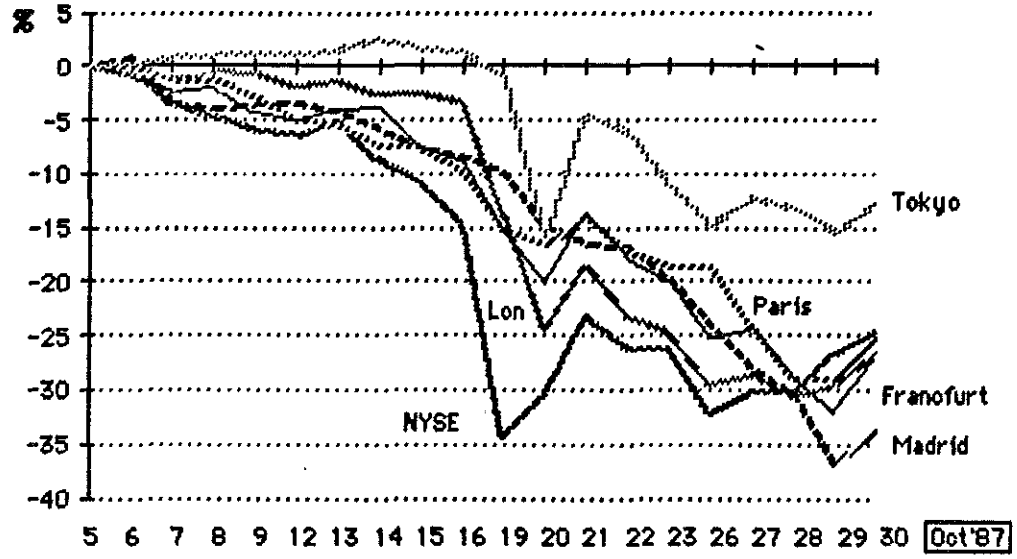

Fig.10

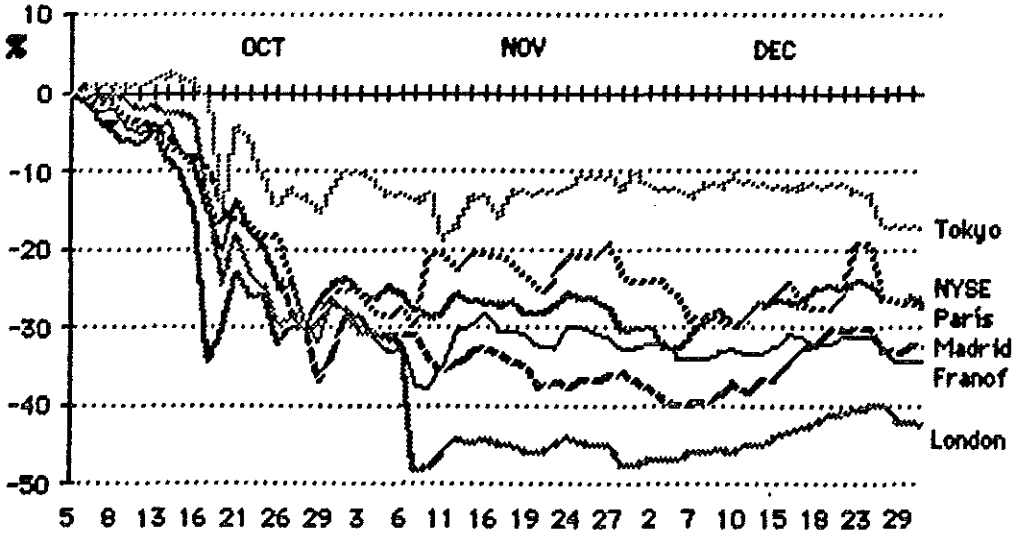

Fig.11

The returns evolution during the last October in the Paris, Francfurt and Madrid Stock Exchanges is shown in figure 9. On October 19th the two first mentioned markets were down a 6% and an 8%, respectively, and the following day also a 3% and a 6%, which does not seem too much in comparison with the falls registered in the three main world markets, although they will be involved afterwards in falls over 6 points and rises of about 8% during the following days. The case of Madrid requires a special mention because there the *black monday* passed unnoticed, since it was only down a 2% that was followed by another fall of 6% the next day. The main Spanish stock market had his *black day* on October 29th, when it got a negative return about 10%. The reason must be searched in the established limit of 10% in the above said market with the aim of avoiding strong movements of falling and rising; later this limit was increased up to 20%, in order to have, in this market, a positive effect on liquidity.

The accumulated fall during October and during the last quarter of the year are shown in figures 10 and 11 respectively. In the first case, this month began with a general fall of all the markets with the only exception of the Japanese *kabuto*. Since the beginning of the collapse the NYSE fell down near a 35% with respect to the first day of October. It was followed by London with a 25%. Curiously Madrid was the market with a smaller fall. At the end of this month, this last market has got the greatest fall of all (a 34%), being the Japanese the one with the least loss (a 13%) followed by New York (25%). At the end of the quarter the Japanese was again the market with a greater endurance (with a loss of 17%) and London was the one in the worse situation (a loss of 42%). The other markets had losses between a 25% and a 35%.

The next step in our study consists in an statistic study of the interrelationship among the above mentioned stock markets. We must bear in mind the horary differences in the opening, as well as some special characteristics of the quotation in some of them. The Japanese market is the first to open, closing before the opening of the Francfurt, London, Paris and Madrid stock markets. This is why these markets must show in their behaviour what had previously occurred in Tokyo. The Madrid stock market has the shorter duration among them (around two hours only), being London the most flexible and longer through its Big Bang system. Wall Street opens the last. On account of the foresaid

causes we shall compare the one day anticipated returns series when it were necessary.

Thus, in first place, we check the statistical relations between European and Japanese stocks exchanges in opposition of Wall Street, because *a priori*, this one seems to be the generating engine of the general behaviour of others markets. The regressions obtained (figure 12) confirm this relation in all the cases. As a matter of fact, the statistical significance of the regression coefficients ("t" statistics over 1.98) permit us to assure that the behaviour of the New York stock market has an influence on the rest of markets in several degrees. The Tokyo stock exchange seems to be the most directly influenced (see its determination coefficient), being Paris the least influenced; but this last comment must be slightly modified on account of the self-correlation in the Tokyo and Madrid cases.

The same correlations group have been carried out considering, successively, as independent variable each one of the stock markets seen before. In this way, the results that show the influence of the Japanese market on the rest are shown in figure 13. We can see in it the strong influence developed on the Francfurt market, and the lack of significance found with respect to the Wall Street and Paris markets.

How the German market influences on the rest of the stock markets and specially on London (a 47,9%) can be seen in figure 14, at the same time it is shown that its effect on the Japanese market lack of significance. By the way, Francfurt is the market with a greater significance with respect to the Madrid stock market (near a 27%).

The London market (figure 15) exercises a strong influence on Francfurt (a 47,9%) and, as in the previous case, it has no any influence on the Eastern stock market.

The French market (figure 16) has a very feeble influence on the rest of the markets; in fact, the most affected is Francfurt (only a 17%) and it has no influence on Tokyo.

Finally, the Spanish market only affects the German stock market (figure 17), since in the rest of cases it has a lack of significance.

NYSE

Dependent variable	Regress. Coeff.	"t" Statistic	Determinat. Coeff.	Durbin- Watson Statistic
Tokyo(-1)	0,4724	5,446	0,331	2,828
Francfurt	0,3801	4,532	0,255	2,169
London	0,4976	4,102	0,219	2,208
Paris	0,2421	2,344	0,083	1,904
Madrid(-1)	0,2956	3,795	0,193	1,532

Fig.12

Tokyo

Dependent variable	Regress. Coeff.	"t" Statistic	Determinat. Coeff.	Durbin- Watson Statistic
Francfurt	0,5044	5,108	0,303	1,907
London	0,5721	3,816	0,195	1,917
Paris	0,2424	1,900	0,056	1,822
Madrid	0,2903	2,934	0,125	1,597
NYSE	0,2434	1,581	0,040	2,124

Fig.13

Francfurt

Dependent variable	Regress. Coeff.	"t" Statistic	Determinat. Coeff.	Durbin- Watson Statistic
London	0,9785	7,437	0,479	1,942
Paris	0,4526	3,457	0,166	2,034
Madrid(-1)	0,4628	4,691	0,268	1,840
NYSE	0,6710	4,532	0,255	2,174
Tokyo(-1)	0,1456	1,043	0,017	2,808

Fig.14

London

Dependent variable	Regress. Coeff.	"t" Statistic	Determinat. Coeff.	Durbin-Watson Statistic
Paris(-1)	-0,2744	-2,886	0,122	1,551
Madrid(-1)	0,3043	4,257	0,232	1,671
NYSE	0,4400	4,101	0,219	2,170
Tokyo(-1)	-0,0136	-0,136	0,0003	2,650
Francfurt	0,4900	7,437	0,479	1,910

Fig.15

Paris

Dependent variable	Regress. Coeff.	"t" Statistic	Determinat. Coeff.	Durbin-Watson Statistic
Madrid(-1)	0,2957	3,064	0,135	1,580
NYSE	0,3460	2,344	0,084	2,030
Tokyo(-1)	-0,0139	-0,109	0,0002	2,663
Francfurt	0,3670	3,457	0,166	2,150
London	0,4166	2,684	0,107	1,827

Fig.16

Madrid

Dependent variable	Regress. Coeff.	"t" Statistic	Determinat. Coeff.	Durbin-Watson Statistic
NYSE	0,0689	0,360	0,002	2,007
Tokyo(-1)	-0,0457	-0,291	0,001	2,649
Francfurt	0,4512	3,417	0,163	2,240
London	0,2016	0,997	0,016	2,093
Paris	0,2345	1,490	0,035	1,992

Fig.17

Although the cause-effect relations are difficult to detect in Economy using classical techniques of correlation and regression, we can see, in base of the analysis made in the previous paragraphs, that there is a high grade of interrelationship among the stock markets analysed, being Wall Street the most important of them, since it points out the general evolution of the others. We can see a diagram in figure 18 showing those relations that resulted significant among the six markets. is shown; The relations with a determination coefficient over 30% are indicated with a thicker line. We can observe analysing this figure that the importance of the Wall Street influence on the Japanese *Kabuto* and that of this one on the axis Francfurt-London; at the same time it is possible to observe that the North American market has a significant influence on the Japanese one but the opposite does not occurs.

Finally, referring to the London stock market it is possible to observe in the figure 19 the effect produced by the American, Japanese and German stock markets on the former. The behaviour of the last three explains about the 51% of the behaviour of London, but, curiously, the influence of New York and Tokyo is not significant (the "t" statistic of both of them is less than 1.98), being Francfurt the market with a greater influence on London (in fact, only this market has a significant influence).

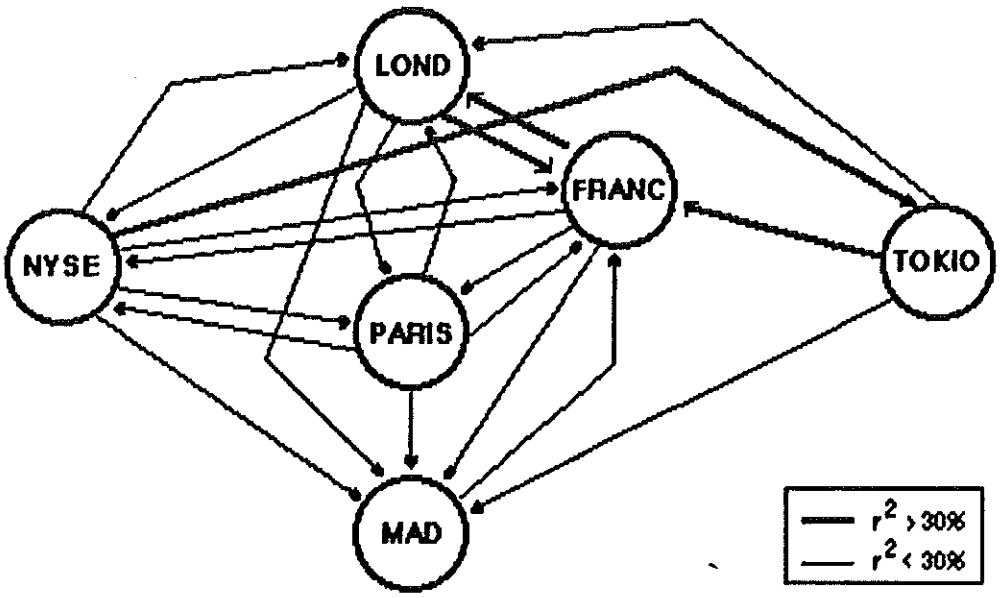

Fig.18

London	Regression coefficient	"t" Statistic	Determination coefficient	D-W Statistic
NYSE	0.1805	1.5788	0.5061	1.962
Francfurt	0.7748	4.345		
Tokyo	0.1373	0.9541		

Fig.19

Appendix

1. Independent variable: New York

1.1 Dependent variable: Tokio (-1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-5,4503E-2	3,4350E-1	-1,5867E-1	8,69E-1
NYSE	4,7249E-1	8,6751E-2	5,4465E0	1,97E-5

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	2,1454E2	1	2,1454E2	2,9664E1	1,97E-5
Error	4,3394E2	60	7,2324E0		
Total	6,4849E2	61			

Coefficient of Determination	3,3084E-1
Coefficient of Correlation	5,7519E-1
Standard Error of Estimate	2,6893E0
Durbin-Watson Statistic	2,8288E0

1.2. Dependent variable: Francfort

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-4,7569E-1	3,3209E-1	-1,4324E0	1,54E-1
NYSE	3,8015E-1	8,3871E-2	4,5326E0	1,18E-4

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	1,3888E2	1	1,3888E2	2,0544E1	1,18E-4
Error	4,0561E2	60	6,7601E0		
Total	5,4449E2	61			

Coefficient of Determination	2,5507E-1
Coefficient of Correlation	5,0504E-1
Standard Error of Estimate	2,6000E0
Durbin-Watson Statistic	2,1695E0

1.3. Dependent variable: London

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-5,7920E-1	4,8043E-1	-1,2056E0	2,31E-1
NYSE	4,9768E-1	1,2133E-1	4,1018E0	3,01E-4

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	2,3803E2	1	2,3803E2	1,6825E1	3,01E-4
Error	8,4888E2	60	1,4148E1		
Total	1,0869E3	61			

Coefficient of Determination	2,1900E-1
Coefficient of Correlation	4,6798E-1
Standard Error of Estimate	3,7614E0
Durbin-Watson Statistic	2,2082E0

1.4. Variable dependent: Paris

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-3,6145E-1	4,0896E-1	-8,8383E-1	6,16E-1
NYSE	2,4215E-1	1,0328E-1	2,3445E0	2,11E-2

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	5,6351E1	1	5,6351E1	5,4966E0	2,11E-2
Error	6,1512E2	60	1,0252E1		
Total	6,7147E2	61			

Coefficient of Determination	8,3923E-2
Coefficient of Correlation	2,8969E-1
Standard Error of Estimate	3,2019E0
Durbin-Watson Statistic	1,9049E0

1.5. Variable dependent: Madrid (-1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-4,8100E-1	3,0845E-1	-1,5594E0	1,20E-1
NYSE	2,9563E-1	7,7899E-2	3,7951E0	6,09E-4

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	8,3994E1	1	8,3994E1	1,4403E1	6,09E-4
Error	3,4991E2	60	5,8318E0		
Total	4,3390E2	61			

Coefficient of Determination	1,9358E-1
Coefficient of Correlation	4,3998E-1
Standard Error of Estimate	2,4149E0
Durbin-Watson Statistic	1,5318E0

2. Independent variable: Tokio

2.1. Dependent variable: Francfort

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-5,1020E-1	3,2033E-1	-1,5927E0	1,13E-1
Tokio	5,0439E-1	9,8738E-2	5,1084E0	3,70E-5

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	1,6503E2	1	1,6503E2	2,6096E1	3,70E-5
Error	3,7945E2	60	6,3242E0		
Total	5,4449E2	61			

Coefficient of Determination	3,0310E-1
Coefficient of Correlation	5,5054E-1
Standard Error of Estimate	2,5148E0
Durbin-Watson Statistic	1,9071E0

2.2 Dependent variable: London

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-6,4638E-1	4,8632E-1	-1,3291E0	1,86E-1
Tokio	5,7209E-1	1,4990E-1	3,8164E0	5,79E-4

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	2,1231E2	1	2,1231E2	1,4565E1	5,79E-4
Error	8,7460E2	60	1,4577E1		
Total	1,0869E3	61			

Coefficient of Determination	1,9533E-1
Coefficient of Correlation	4,4197E-1
Standard Error of Estimate	3,8179E0
Durbin-Watson Statistic	1,9172E0

2.3. Dependent variable: Paris

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-4,0309E-1	4,1384E-1	-9,7403E-1	6,65E-1
Tokio	2,4245E-1	1,2756E-1	1,9006E0	5,89E-2

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	3,8131E1	1	3,8131E1	3,6124E0	5,89E-2
Error	6,3334E2	60	1,0556E1		
Total	6,7147E2	61			

Coefficient of Determination	5,6787E-2
Coefficient of Correlation	2,3830E-1
Standard Error of Estimate	3,2489E0
Durbin-Watson Statistic	1,8227E0

2.4. Dependent variable: Madrid

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-5,1922E-1	3,2099E-1	-1,6176E0	1,07E-1
Tokio	2,9030E-1	9,8943E-2	2,9340E0	4,94E-3

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	5,4669E1	1	5,4669E1	8,6086E0	4,94E-3
Error	3,8103E2	60	6,3505E0		
Total	4,3570E2	61			

Coefficient of Determination	1,2547E-1
Coefficient of Correlation	3,5422E-1
Standard Error of Estimate	2,5200E0
Durbin-Watson Statistic	1,5979E0

2.5. Dependent variable: New York

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-3,6092E-1	4,9948E-1	-7,2259E-1	5,20E-1
Tokio	2,4339E-1	1,5396E-1	1,5809E0	1,15E-1

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	3,8429E1	1	3,8429E1	2,4991E0	1,15E-1
Error	9,2260E2	60	1,5377E1		
Total	9,6103E2	61			

Coefficient of Determination	3,9987E-2
Coefficient of Correlation	1,9997E-1
Standard Error of Estimate	3,9213E0
Durbin-Watson Statistic	2,1246E0

3. Independent variable: Francfort

3.1. Dependent variable: London

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-1,6673E-1	3,9879E-1	-4,1808E-1	6,81E-1
Francfort	9,7852E-1	1,3157E-1	7,4370E0	9,04E-7

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	5,2134E2	1	5,2134E2	5,5309E1	9,04E-7
Error	5,6556E2	60	9,4261E0		
Total	1,0869E3	61			

Coefficient of Determination	4,7966E-1
Coefficient of Correlation	6,9257E-1
Standard Error of Estimate	3,0702E0
Durbin-Watson Statistic	1,9420E0

3.2. Dependent variable: Paris

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-1,7569E-1	3,9680E-1	-4,4277E-1	6,64E-1
Francfort	4,5263E-1	1,3092E-1	3,4574E0	1,36E-3

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	1,1155E2	1	1,1155E2	1,1954E1	1,36E-3
Error	5,5992E2	60	9,3319E0		
Total	6,7147E2	61			

Coefficient of Determination	1,6613E-1
Coefficient of Correlation	4,0759E-1
Standard Error of Estimate	3,0548E0
Durbin-Watson Statistic	2,0343E0

3.3. Dependent variable: Madrid (-1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-3,1152E-1	2,9877E-1	-1,0427E0	3,02E-1
Francfort	4,6248E-1	9,8574E-2	4,6918E0	8,47E-5

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	1,1646E2	1	1,1646E2	2,2013E1	8,47E-5
Error	3,1744E2	60	5,2907E0		
Total	4,3390E2	61			

Coefficient of Determination	2,6841E-1
Coefficient of Correlation	5,1808E-1
Standard Error of Estimate	2,3001E0
Durbin-Watson Statistic	1,8406E0

3.4. Dependent variable: New York

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	5,0992E-3	4,4868E-1	1,1365E-2	9,88E-1
Francfort	6,7097E-1	1,4803E-1	4,5326E0	1,18E-4

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	2,4513E2	1	2,4513E2	2,0544E1	1,18E-4
Error	7,1590E2	60	1,1932E1		
Total	9,6103E2	61			

Coefficient of Determination	2,5507E-1
Coefficient of Correlation	5,0504E-1
Standard Error of Estimate	3,4542E0
Durbin-Watson Statistic	2,1740E0

3.5. Dependent variable: Tokio (+1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-1,6109E-1	4,2321E-1	-3,8063E-1	7,06E-1
Francfort	1,4564E-1	1,3963E-1	1,0431E0	3,02E-1

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	1,1549E1	1	1,1549E1	1,0880E0	3,02E-1
Error	6,3694E2	60	1,0616E1		
Total	6,4849E2	61			

Coefficient of Determination	1,7810E-2
Coefficient of Correlation	1,3345E-1
Standard Error of Estimate	3,2582E0
Durbin-Watson Statistic	2,8087E0

4. Independent variable: London

4.1. Dependent variable: Paris (-1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-6,7995E-1	4,0512E-1	-1,6784E0	9,46E-2
London	-2,7446E-1	9,5084E-2	-2,8865E0	5,56E-3

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	8,1876E1	1	8,1876E1	8,3320E0	5,56E-3
Error	5,8960E2	60	9,8267E0		
Total	6,7148E2	61			

Coefficient of Determination	1,2193E-1
Coefficient of Correlation	3,4919E-1
Standard Error of Estimate	3,1348E0
Durbin-Watson Statistic	1,5510E0

4.2. Dependent variable: Madrid (-1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-3,6551E-1	3,0456E-1	-1,2001E0	2,33E-1
London	3,0434E-1	7,1482E-2	4,2575E0	2,13E-4

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	1,0067E2	1	1,0067E2	1,8127E1	2,13E-4
Error	3,3323E2	60	5,5538E0		
Total	4,3390E2	61			

Coefficient of Determination	2,3202E-1
Coefficient of Correlation	4,8168E-1
Standard Error of Estimate	2,3567E0
Durbin-Watson Statistic	1,6714E0

4.3. Dependent variable: New York

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-7,4405E-2	4,5709E-1	-1,6278E-1	8,66E-1
London	4,4004E-1	1,0726E-1	4,1018E0	3,01E-4

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	2,1047E2	1	2,1047E2	1,6825E1	3,01E-4
Error	7,5056E2	60	1,2509E1		
Total	9,6103E2	61			

Coefficient of Determination	2,1900E-1
Coefficient of Correlation	4,6798E-1
Standard Error of Estimate	3,5369E0
Durbin-Watson Statistic	2,1794E0

4.4. Dependent variable: Tokio (-1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-2,6446E-1	4,2481E-1	-6,2255E-1	5,43E-1
London	-1,3629E-2	9,9704E-2	-1,3669E-1	8,87E-1

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	2,0188E-1	1	2,0188E-1	1,8685E-2	8,87E-1
Error	6,4829E2	60	1,0805E1		
Total	6,4849E2	61			

Coefficient of Determination	3,1131E-4
Coefficient of Correlation	1,7644E-2
Standard Error of Estimate	3,2871E0
Durbin-Watson Statistic	2,6502E0

4.5. Dependent variable: Francfort

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-2,4919E-1	2,8083E-1	-8,8734E-1	6,18E-1
London	4,9019E-1	6,5912E-2	7,4370E0	9,04E-7

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	2,6117E2	1	2,6117E2	5,5309E1	9,04E-7
Error	2,8332E2	60	4,7220E0		
Total	5,4449E2	61			

Coefficient of Determination	4,7966E-1
Coefficient of Correlation	6,9257E-1
Standard Error of Estimate	2,1730E0
Durbin-Watson Statistic	1,9086E0

5. Independent variable: Paris

5.1. Dependent variable: Madrid (-1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-4,6855E-1	3,2071E-1	-1,4610E0	1,46E-1
Paris	2,9575E-1	9,6499E-2	3,0648E0	3,57E-3

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	5,8734E1	1	5,8734E1	9,3932E0	3,57E-3
Error	3,7517E2	60	6,2528E0		
Total	4,3390E2	61			

Coefficient of Determination	1,3536E-1
Coefficient of Correlation	3,6792E-1
Standard Error of Estimate	2,5006E0
Durbin-Watson Statistic	1,5804E0

5.2. Dependent variable: New York

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-2,6096E-1	4,9128E-1	-5,3118E-1	6,04E-1
Paris	3,4657E-1	1,4782E-1	2,3445E0	2,11E-2

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	8,0652E1	1	8,0652E1	5,4966E0	2,11E-2
Error	8,8038E2	60	1,4673E1		
Total	9,6103E2	61			

Coefficient of Determination	8,3923E-2
Coefficient of Correlation	2,8969E-1
Standard Error of Estimate	3,8305E0
Durbin-Watson Statistic	2,0296E0

5.3 Dependent variable: Tokio (-1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-2,6016E-1	4,2160E-1	-6,1707E-1	5,47E-1
Paris	-1,3907E-2	1,2686E-1	-1,0962E-1	9,09E-1

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	1,2986E-1	1	1,2986E-1	1,2017E-2	9,09E-1
Error	6,4836E2	60	1,0806E1		
Total	6,4849E2	61			

Coefficient of Determination	2,0025E-4
Coefficient of Correlation	1,4151E-2
Standard Error of Estimate	3,2872E0
Durbin-Watson Statistic	2,6635E0

5.4. Dependent variable: Francfort

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-4,6583E-1	3,5281E-1	-1,3203E0	1,89E-1
Paris	3,6704E-1	1,0616E-1	3,4574E0	1,36E-3

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	9,0458E1	1	9,0458E1	1,1954E1	1,36E-3
Error	4,5403E2	60	7,5672E0		
Total	5,4449E2	61			

Coefficient of Determination	1,6613E-1
Coefficient of Correlation	4,0759E-1
Standard Error of Estimate	2,7509E0
Durbin-Watson Statistic	2,1545E0

5.5. Dependent variable: London

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-5,9592E-1	5,1578E-1	-1,1554E0	2,51E-1
Paris	4,1660E-1	1,5520E-1	2,6843E0	9,18E-3

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	1,1654E2	1	1,1654E2	7,2057E0	9,18E-3
Error	9,7037E2	60	1,6173E1		
Total	1,0869E3	61			

Coefficient of Determination	1,0722E-1
Coefficient of Correlation	3,2744E-1
Standard Error of Estimate	4,0216E0
Durbin-Watson Statistic	1,8270E0

6. Independent variable: Madrid

6.1. Dependent variable: New York

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-3,8082E-1	5,2021E-1	-7,3204E-1	5,26E-1
Madrid	6,8957E-2	1,9153E-1	3,6004E-1	7,21E-1

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	2,0718E0	1	2,0718E0	1,2963E-1	7,21E-1
Error	9,5896E2	60	1,5983E1		
Total	9,6103E2	61			

Coefficient of Determination	2,1558E-3
Coefficient of Correlation	4,6431E-2
Standard Error of Estimate	3,9978E0
Durbin-Watson Statistic	2,0072E0

6.2. Dependent variable: Tokio (-1)

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-2,8079E-1	4,2749E-1	-6,5683E-1	5,21E-1
Madrid	-4,5772E-2	1,5739E-1	-2,9082E-1	7,69E-1

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	9,1284E-1	1	9,1284E-1	8,4577E-2	7,69E-1
Error	6,4758E2	60	1,0793E1		
Total	6,4849E2	61			

Coefficient of Determination	1,4076E-3
Coefficient of Correlation	3,7518E-2
Standard Error of Estimate	3,2853E0
Durbin-Watson Statistic	2,6498E0

6.3. Dependent variable: Francfort

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-3,6901E-1	3,5864E-1	-1,0289E0	3,08E-1
Madrid	4,5125E-1	1,3204E-1	3,4175E0	1,50E-3

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	8,8718E1	1	8,8718E1	1,1679E1	1,50E-3
Error	4,5577E2	60	7,5962E0		
Total	5,4449E2	61			

Coefficient of Determination	1,6294E-1
Coefficient of Correlation	4,0366E-1
Standard Error of Estimate	2,7561E0
Durbin-Watson Statistic	2,2407E0

6.4 Dependent variable: London

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-6,6975E-1	5,4930E-1	-1,2193E0	2,25E-1
Madrid	2,0162E-1	2,0224E-1	9,9695E-1	6,76E-1

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	1,7712E1	1	1,7712E1	9,9391E-1	6,76E-1
Error	1,0692E3	60	1,7820E1		
Total	1,0869E3	61			

Coefficient of Determination	1,6295E-2
Coefficient of Correlation	1,2765E-1
Standard Error of Estimate	4,2214E0
Durbin-Watson Statistic	2,0937E0

6.5. Dependent variable: Paris

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-3,2481E-1	4,2747E-1	-7,5983E-1	5,43E-1
Madrid	2,3452E-1	1,5738E-1	1,4901E0	1,38E-1

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	2,3962E1	1	2,3962E1	2,2204E0	1,38E-1
Error	6,4751E2	60	1,0792E1		
Total	6,7147E2	61			

Coefficient of Determination	3,5687E-2
Coefficient of Correlation	1,8891E-1
Standard Error of Estimate	3,2851E0
Durbin-Watson Statistic	1,9920E0

3. Independent variables: New York, Francfort and Tokio

Dependent variable: London

Variable Name	Coefficient	Std. Err. Estimate	t Statistic	Prob > t
Constant	-1,8589E-1	3,9561E-1	-4,6987E-1	6,45E-1
NYSE	1,8057E-1	1,1437E-1	1,5788E0	1,16E-1
Francfort	7,7485E-1	1,7834E-1	4,3449E0	1,76E-4
Tokio	1,3732E-1	1,4392E-1	9,5409E-1	6,54E-1

Source	Sum of Squares	Deg. of Freedom	Mean Squares	F-Ratio	Prob>F
Model	5,5015E2	3	1,8338E2	1,9816E1	1,50E-6
Error	5,3676E2	58	9,2544E0		
Total	1,0869E3	61			

Coefficient of Determination	5,0616E-1
Coefficient of Correlation	7,1145E-1
Standard Error of Estimate	3,0421E0
Durbin-Watson Statistic	1,9620E0