



Organización Internacional del Café
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**Correlation between coffee prices
and stocks**

Background

In the context of its programme of activities, the Organization pays particular attention to changes in coffee market fundamentals and their influence on prices. The present study provides an analysis of the relationship between coffee prices and world stocks.

Action

The Executive Board is requested to take note of this document.

CORRELATION BETWEEN COFFEE PRICES AND STOCKS

1. Insofar as stocks are one of the fundamental factors influencing the market, their relationship with price movements is of concern to all players in the coffee chain. The purpose of this study is to investigate associations between stocks and prices and permit an assessment of marketing strategies based on stocks. The methodology employed uses correlation tests for two statistical series: ICO composite indicator prices and prices on the New York and London futures markets. Analysis of the relationship between stocks and prices was carried out for the period 1965-2003 as well as for a number of specific periods within this broader time-period. The first covers the years 1965-1988 and corresponds to the period when the ICO quota system was in force. The second, beginning with the year when quotas were suspended and extending to 2003, corresponds to the free market period (1989-2003). On the basis of observation of recent phenomena, this second period was divided into a number of sub-periods, taking into account both the years during which certain exporting countries carried out concerted action to support prices, particularly stock retention policies, and the entry into force of International Coffee Agreements without economic clauses providing for direct intervention in the market. A final sub-period covers the years between 1997-2003 and follows recent developments in the coffee market.

The following points will be covered:

- I. Correlation between prices and world stocks
- II. Correlation between prices and stocks in exporting countries
- III. Correlation between prices and stocks in importing countries

I. Correlation between prices and world coffee stocks

2. Table 1 below shows world stocks and annual changes since 1965. World stocks were very high during the 1960s before falling continuously until 1979. The drawing down of stocks during the 1970s was accentuated by the frosts in Brazil in July 1975, which considerably reduced availability. During the 1980s and early 1990s stocks increased substantially.

Table 1: World coffee stocks and ICO composite indicator prices since 1965

Year	World stocks	% change	Composite price	% change	Year	World stocks	% change	Composite price	% change
1965	76,881		40.37		1985	54,786	-10.42%	133.10	-5.73%
1966	91,889	19.52%	39.61	-1.88%	1986	53,328	-2.66%	170.93	28.42%
1967	87,589	-4.68%	37.22	-6.03%	1987	52,530	-1.50%	107.81	-36.93%
1968	85,795	-2.05%	37.36	0.38%	1988	76,758	46.12%	115.96	7.56%
1969	79,926	-6.84%	38.71	3.61%	1989	72,967	-4.94%	91.67	-20.95%
1970	72,939	-8.74%	50.52	30.51%	1990	67,391	-7.64%	71.53	-21.97%
1971	61,674	-15.44%	44.66	-11.60%	1991	71,135	5.56%	66.80	-6.61%
1972	61,991	0.51%	50.41	12.88%	1992	70,696	-0.62%	53.35	-20.13%
1973	64,250	3.64%	62.16	23.31%	1993	62,017	-12.28%	61.63	15.52%
1974	50,755	-21.00%	67.95	9.31%	1994	56,653	-8.65%	134.45	118.16%
1975	57,342	12.98%	71.73	5.56%	1995	54,624	-3.58%	138.42	2.95%
1976	52,270	-8.85%	141.96	97.91%	1996	42,934	-21.40%	102.07	-26.26%
1977	36,355	-30.45%	229.21	61.46%	1997	37,679	-12.24%	133.91	31.19%
1978	38,328	5.43%	155.15	-32.31%	1998	34,438	-8.60%	108.95	-18.64%
1979	36,751	-4.11%	169.50	9.25%	1999	31,681	-8.01%	85.72	-21.32%
1980	40,482	10.15%	150.67	-11.11%	2000	32,213	1.68%	64.25	-25.05%
1981	44,009	8.71%	115.42	-23.40%	2001	37,222	15.55%	45.60	-29.03%
1982	61,063	38.75%	125.00	8.30%	2002	38,144	2.48%	47.74	4.69%
1983	59,682	-2.26%	127.98	2.38%	2003	41,267	8.19%	51.91	8.73%
1984	61,158	2.47%	141.19	10.32%					

Stocks in 000 bags – Composite price in US cents/lb

3. Table 2 shows the results of correlation tests for prices and world stocks.

Table 2: Correlation coefficients for world stocks and prices

Indicator prices	1965-2003	1965-1988	1989-2003	1993-2001	1994-2003	1997-2003
ICO composite	-0.48	-0.78	-0.05	+0.28	+0.57	-0.25
Colombian Milds	-0.59	-0.81	-0.20	+0.07	+0.35	-0.28
Other Milds	-0.53	-0.74	-0.14	+0.12	+0.39	-0.20
Brazilian Naturals	-0.49	-0.77	-0.09	+0.20	+0.46	-0.25
Robustas	-0.41	-0.79	+0.10	+0.47	+0.72	-0.38
NYBOT	-0.53	-0.76	-0.09	+0.14	+0.42	-0.33
LIFFE	-0.40	-0.78	+0.09	+0.45	+0.71	-0.40

4. The test results show a negative correlation for the period 1965-2003 both for world stocks and ICO composite indicator prices and for the average of the 2nd and 3rd positions of the New York and London futures markets. In other words, low stock levels entail high prices. The same correlation test gives different results for the various sub-periods. The first sub-period covers the years between 1965 and 1988 when coffee prices were regulated

through an export quota system under the economic clauses of the Agreements. Correlation coefficients are strongly negative for all indicator prices. The correlation coefficient for the ICO composite indicator price, for instance, is -0.78. These results clearly indicate the significant influence of stocks on prices when the quota system was in force. This influence disappeared after the suspension of quotas and, as a result, weak correlations were recorded for overall stocks in the period 1989-2003 although there is a strong correlation in the case of stocks in importing countries.

5. During the period 1993-2001, despite some retention efforts on the part of producers, stocks continued to decline. World stocks fell from 62.02 million bags in 1993 to 31.68 million in 1999 before increasing slightly to 32.21 million and 37.22 million bags in 2000 and 2001 respectively. The ICO composite indicator price rose from 61.63 US cents/lb in 1993 to 138.42 cents in 1995 but then began to fall steadily and was down to an average of 45.60 cents in 2001.

6. Correlation tests for the period 1994-2003 indicate that world stocks and prices moved in the same direction insofar as they have a strong positive correlation coefficient. The correlation coefficient for the ICO composite indicator price was 0.57, which implies that prices are weak when stocks are low or else that prices and stocks move upward together. As shown in Graphs 4 and 5 of Annex I the two variables have a relatively similar trend. The highest coefficients were recorded for Robustas, namely 0.72 for the ICO indicator price and 0.71 for the average of the 2nd and 3rd positions on the London futures market (LIFFE). However, if we take into account recent movements in prices and stocks (1997-2003), correlation coefficients become negative and the variables show relatively opposite trends (Graph 6 of Annex I). This means that prices are high when stocks are low or prices are low when stocks are high.

7. Analysis of the correlation between prices and world stocks clearly indicates that the two variables were closely and negatively associated when the economic clauses of the Agreements were in force, particularly the export quota system. The association between these two variables meant that price rises could be expected when world stocks fell or that prices would fall when stocks increased. But this association disappeared during the whole of the so-called free market period. Sub-division of this period indicates that there was a positive correlation between world stocks and prices during the period when stock retention efforts were being made by a number of producing countries. There is also a strong positive correlation during the period 1994-2003 following the entry into force of the International Coffee Agreement 1994 which does not contain any clauses providing for direct intervention in the market. Analysis of the more recent period (1997-2003) yields different results, with negative correlation coefficients. It should be noted, however, that during the last 10 years opening stocks in exporting countries have declined steadily whereas stocks in importing countries have increased. In the more detailed analysis given below stocks in exporting countries and stocks in importing countries are considered separately.

II. Correlation between prices and stocks in exporting countries

8. Data on opening stocks in exporting countries and the ICO composite indicator price are shown in Table 3 below.

Table 3: Opening stocks in exporting countries and ICO composite indicator prices since 1965/66

Crop year	Opening stocks	% change	Composite price	% change	Crop year	Opening stocks	% change	Composite price	% change
1965/66	68,128		40.37		1985/86	48,249	-12.10%	133.10	-5.73%
1966/67	85,811	25.96%	39.61	-1.88%	1986/87	45,271	-6.17%	170.93	28.42%
1967/68	80,983	-5.63%	37.22	-6.03%	1987/88	42,604	-5.89%	107.81	-36.93%
1968/69	80,180	-0.99%	37.36	0.38%	1988/89	64,028	50.29%	115.96	7.56%
1969/70	70,971	-11.49%	38.71	3.61%	1989/90	63,513	-0.80%	91.67	-20.95%
1970/71	64,531	-9.07%	50.52	30.51%	1990/91	55,664	-12.36%	71.53	-21.97%
1971/72	53,803	-16.62%	44.66	-11.60%	1991/92	52,970	-4.84%	66.80	-6.61%
1972/73	53,761	-0.08%	50.41	12.88%	1992/93	54,572	3.02%	53.35	-20.13%
1973/74	55,100	2.49%	62.16	23.31%	1993/94	42,521	-22.08%	61.63	15.52%
1974/75	40,300	-26.86%	67.95	9.31%	1994/95	40,345	-5.12%	134.45	118.16%
1975/76	49,528	22.90%	71.73	5.56%	1995/96	39,687	-1.63%	138.42	2.95%
1976/77	44,800	-9.55%	141.96	97.91%	1996/97	33,517	-15.55%	102.07	-26.26%
1977/78	29,554	-34.03%	229.21	61.46%	1997/98	29,779	-11.15%	133.91	31.19%
1978/79	32,648	10.47%	155.15	-32.31%	1998/99	25,806	-13.34%	108.95	-18.64%
1979/80	30,454	-6.72%	169.50	9.25%	1999/00	23,402	-9.32%	85.72	-21.32%
1980/81	32,710	7.41%	150.67	-11.11%	2000/01	21,635	-7.55%	64.25	-25.05%
1981/82	34,566	5.67%	115.42	-23.40%	2001/02	21,092	-2.51%	45.60	-29.03%
1982/83	52,413	51.63%	125.00	8.30%	2002/03	19,500	-7.55%	47.74	4.69%
1983/84	52,032	-0.73%	127.98	2.38%	2003/04	21,151	8.47%	51.91	8.73%
1984/85	54,893	5.50%	141.19	10.32%					

Stocks in 000 bags – Composite price in US cents/lb

9. The results of the correlation test are shown in table 4 below.

Table 4: Correlation coefficients for opening stocks in exporting countries and prices

Indicator prices	1965-2003	1965-1988	1989-2003	1993-2001	1994-2003	1997-2003
ICO composite	-0.39	-0.76	+0.10	+0.56	+0.88	0.98
Colombian Milds	-0.49	-0.79	-0.03	+0.38	+0.74	0.98
Other Milds	-0.45	-0.73	+0.02	+0.41	+0.76	0.99
Brazilian Naturals	-0.39	-0.76	+0.08	+0.51	+0.82	+0.98
Robustas	-0.31	-0.77	+0.21	+0.70	+0.95	+0.88
NYBOT	-0.46	-0.75	+0.08	+0.44	+0.79	+0.97
LIFFE	-0.30	-0.76	+0.20	+0.69	+0.94	+0.89

10. For the period 1965-2003, tests indicate a negative correlation between prices and stocks in exporting countries. During the sub-period 1965-1988 when the Agreements contained economic clauses providing for a quota system, there were strong negative correlations between the two variables. Price movements were closely associated with changes in stocks and low stock levels meant high prices. During the so-called free market period, however, tests showed weak positive correlations, indicating a waning of the influence of stocks held in exporting countries on prices. On a number of occasions, for instance, a fall in stocks coincides with a fall in prices (Table 3). Analysis of recent data confirms a parallel decline for both variables since there has been a steady fall in prices and a drawing down of stocks in exporting countries. The graphs in Annex II show trends for these two variables over different periods.

III. Correlation between prices and stocks in importing countries

11. Table 5 shows stock movements in importing countries, including free ports.

Table 5: Opening stocks in importing countries and ICO indicator prices since 1965

Year	Opening stocks	% change	Composite price	% change	Year	Opening stocks	% change	Composite price	% change
1965	8,753		40.37		1985	6,537	+4.34	133.10	-5.73%
1966	6,078	-30.56	39.61	-1.88%	1986	8,057	+23.25	170.93	28.42%
1967	6,606	+8.69	37.22	-6.03%	1987	9,926	+23.20	107.81	-36.93%
1968	5,615	-15.00	37.36	0.38%	1988	12,730	+28.25	115.96	7.56%
1969	8,955	+59.48	38.71	3.61%	1989	9,454	-25.73	91.67	-20.95%
1970	8,408	-6.11	50.52	30.51%	1990	11,727	+24.04	71.53	-21.97%
1971	7,871	-6.39	44.66	-11.60%	1991	18,165	+54.90	66.80	-6.61%
1972	8,230	+4.56	50.41	12.88%	1992	16,124	-11.24	53.35	-20.13%
1973	9,150	+11.18	62.16	23.31%	1993	19,496	+20.91	61.63	15.52%
1974	10,455	+14.26	67.95	9.31%	1994	16,308	-16.35	134.45	118.16%
1975	7,814	-25.26	71.73	5.56%	1995	14,937	-8.41	138.42	2.95%
1976	7,470	-4.40	141.96	97.91%	1996	9,417	-36.96	102.07	-26.26%
1977	6,801	-8.96	229.21	61.46%	1997	7,900	-16.11	133.91	31.19%
1978	5,680	-16.48	155.15	-32.31%	1998	8,632	+9.27	108.95	-18.64%
1979	6,297	+10.86	169.50	9.25%	1999	8,279	-4.09	85.72	-21.32%
1980	7,772	+23.42	150.67	-11.11%	2000	10,578	+27.77	64.25	-25.05%
1981	9,443	+21.50	115.42	-23.40%	2001	16,130	+52.49	45.60	-29.03%
1982	8,650	-8.40	125.00	8.30%	2002	18,644	+15.59	47.74	4.69%
1983	7,650	-11.56	127.98	2.38%	2003	20,116	+7.90	51.91	8.73%
1984	6,265	-18.10	141.19	10.32%					

Stocks in 000 bags – Composite price in US cents/lb

12. Stocks in importing countries have increased significantly during the last few years. During the quota period, stock levels were lower in importing countries, with the highest level at 12.73 million bags in 1988. When export quotas were in force, importing countries did not need coffee stocks since their supplies were assured and exporting countries built up their stocks and bore all the related costs. Following the suspension of the quota system, stock levels in importing countries rose significantly, up from 18.16 million bags in 1991 to 19.50 million in 1993. Since 1997, these stocks have been increasing continuously. The results of price correlation tests are shown in Table 6 below.

Table 6: Correlation coefficients for opening stocks in importing countries and prices

Indicator prices	1965-2003	1965-1988	1989-2003	1993-2001	1994-2003	1997-2003
ICO composite	-0.30	-0.15	-0.49	-0.26	-0.43	-0.82
Colombian Milds	-0.26	-0.20	-0.61	-0.47	-0.60	-0.84
Other Milds	-0.23	-0.11	-0.58	-0.43	-0.55	-0.79
Brazilian Naturals	-0.31	-0.13	-0.57	-0.36	-0.54	-0.82
Robustas	-0.34	-0.21	-0.34	-0.01	-0.26	-0.84
NYBOT	-0.21	-0.09	-0.58	-0.41	-0.55	-0.86
LIFFE	-0.35	-0.19	-0.35	-0.02	-0.27	-0.86

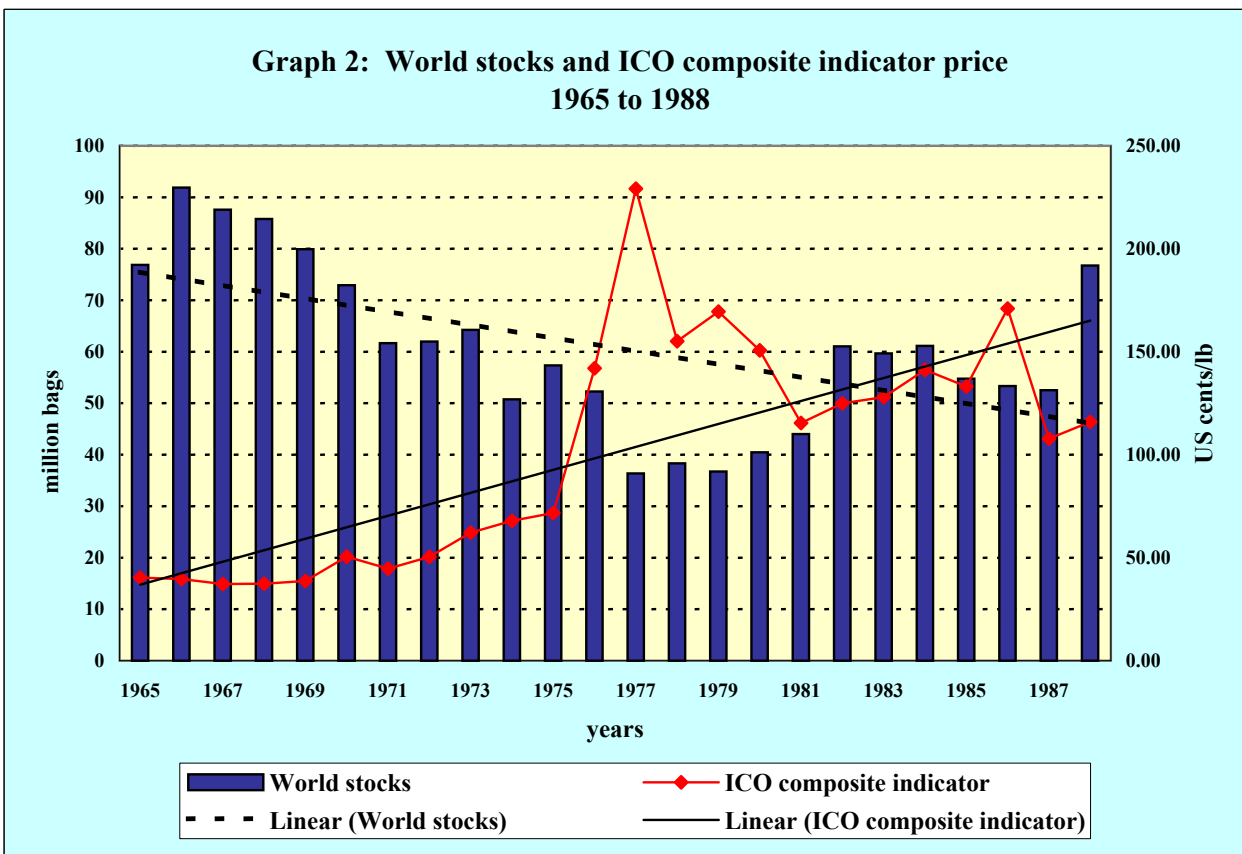
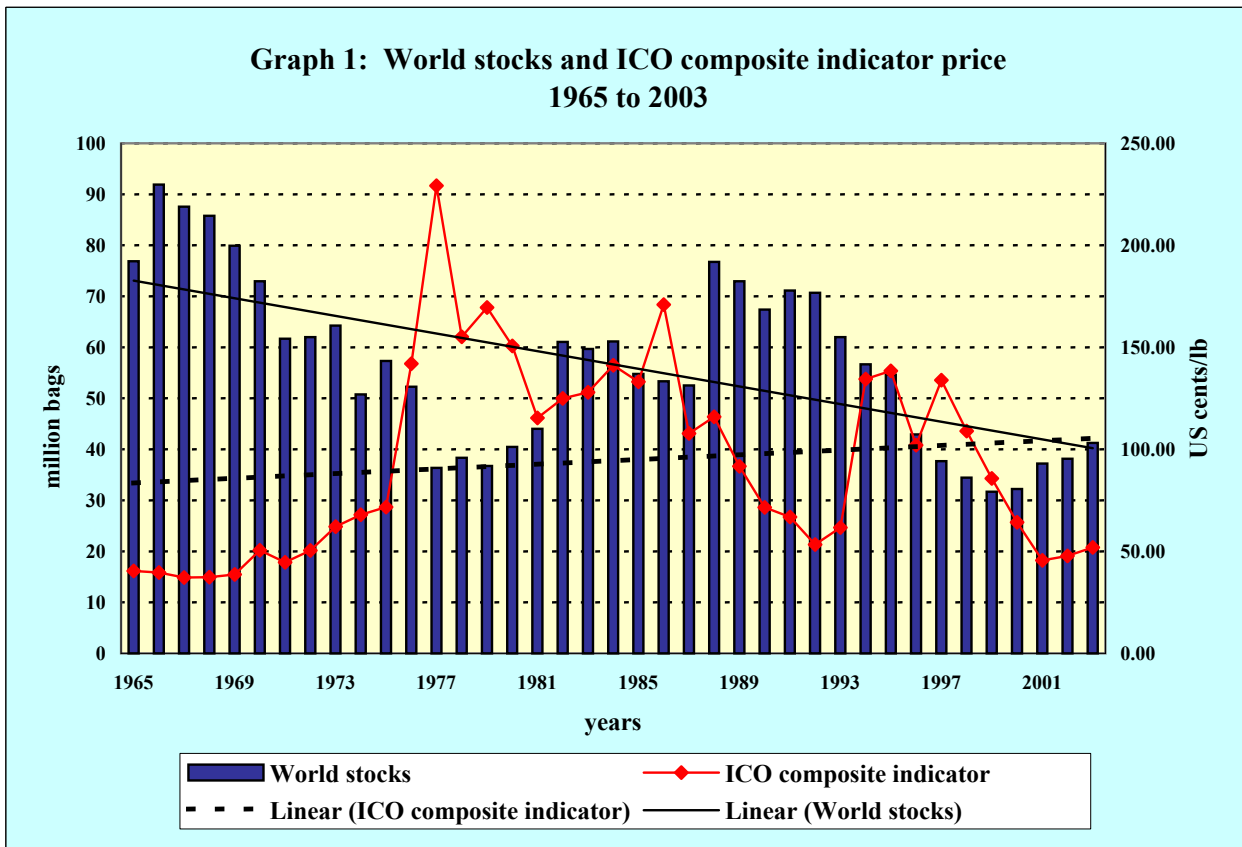
13. The results of the correlation tests confirm the influence of stocks in importing countries on prices. This influence, which was weak during the quota period (1965-1988), has become very significant. Moreover, in recent years, the market has become much more sensitive to stock movements in importing countries. The graphs in Annex III show movements of stocks in importing countries and the ICO composite indicator price over different periods.

Conclusion

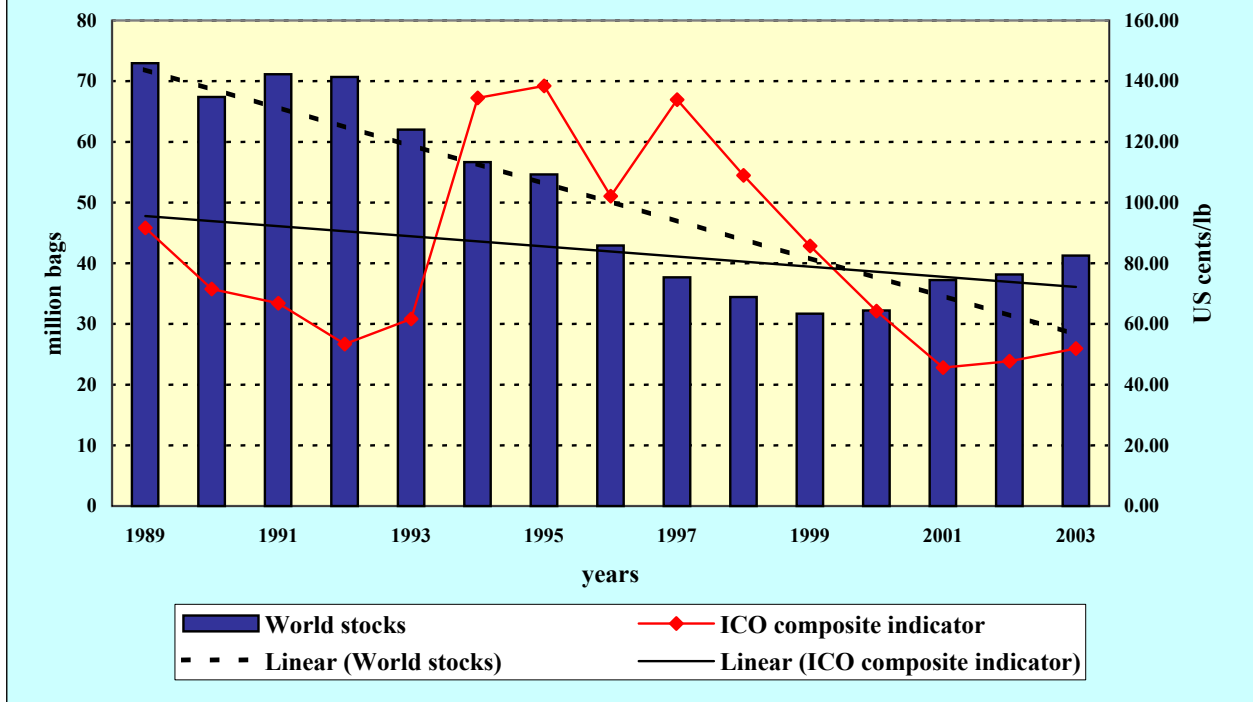
14. Analysis of the various correlation tests shows that the relationship between stocks and prices is associated with the place where stocks are held. The coffee economy has undergone many changes since 1989. The first of these changes relates to the absence of any regulatory mechanism in the International Coffee Agreements designed to correct or cushion market imbalance through export quotas. The second change relates to the progressive liberalization of coffee marketing systems in most exporting countries with the abolition of semi-public bodies for the control and management of internal and external coffee marketing. When the International Coffee Agreements contained economic clauses to support prices, opening stocks in exporting countries had a significant impact on prices. In other words the export quota system gave these semi-public institutions the basis for the management and control of a stock system. By contrast, the free market period witnessed the growing importance of stocks in importing countries. Low price levels meant a transfer of stocks from

exporting countries to importing countries. Analysis also shows that the influence of stocks on prices is equally dependent on the balance between world production and consumption. When there is a shortfall in production relative to market requirements, stock levels in exporting countries are a determining factor in price formation. But when there is excess production, accumulation of stocks in exporting countries has no influence on prices.

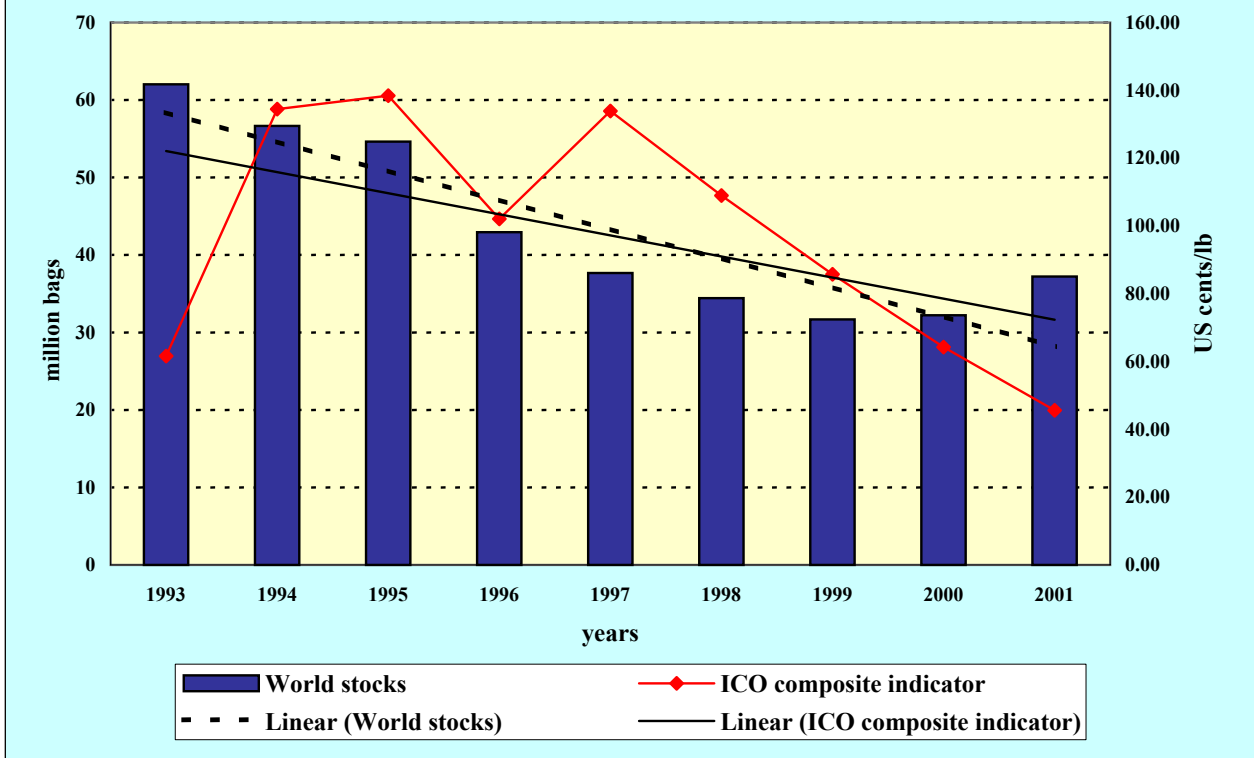
15. It should be noted, however, that since the abolition of the stock verification system in exporting countries, it has become increasingly difficult to obtain accurate estimates of stocks in exporting and importing countries. A reliable information system is needed to provide a real picture of the market and stock levels. Efforts are required at all levels to guarantee the collection of reliable information and reduce discrepancies in estimates from different sources.



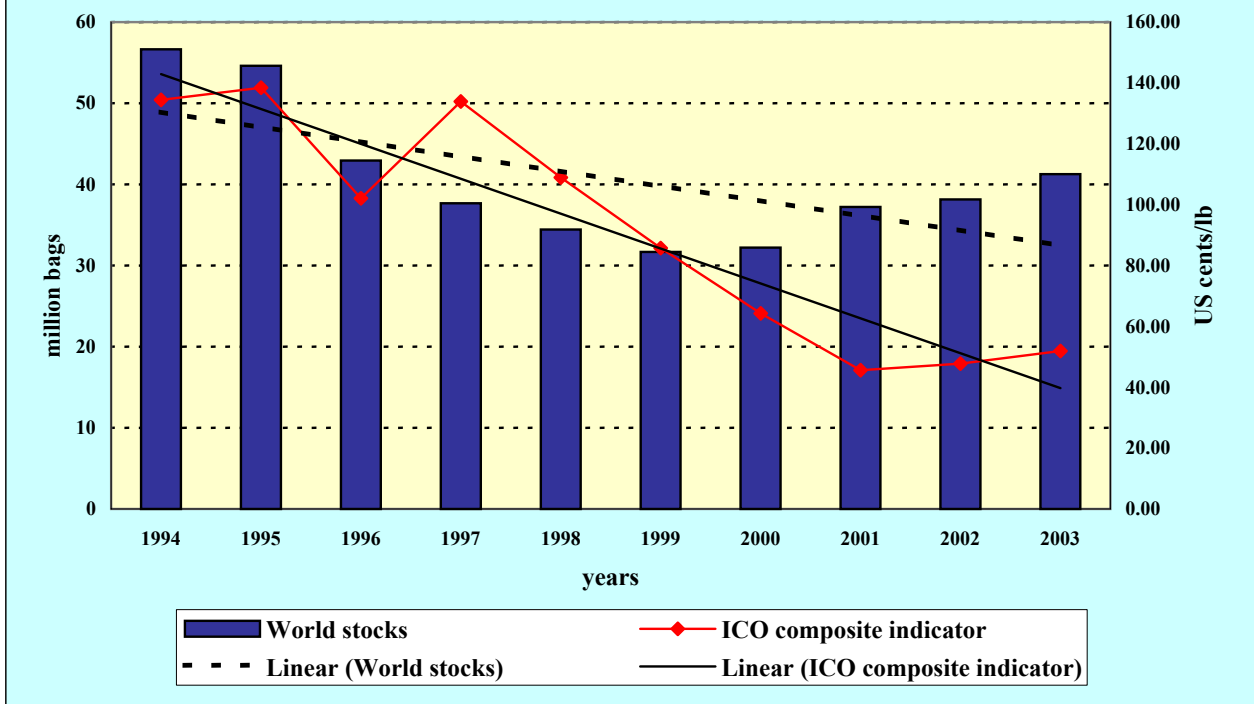
**Graph 3: World stocks and ICO composite indicator price
1989 to 2003**



**Graph 4: World stocks and ICO composite indicator price
1993 to 2001**



**Graph 5: World stocks and ICO composite indicator price
1994 to 2003**



**Graph 6: World stocks and ICO composite indicator price
1997 to 2003**

