An Analysis of Capital Requirements of the UNCTAD Integrated Programme for Commodities

by

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Abstract

Developing countries' proposal of a Common Fund for an "Integrated Programme for Commodities" is analyzed using ordinary least-squares to establish price and export earnings trends for 1961-75. Capital requirement estimates for compensatory financing and export price and earnings stabilization vary from as low as UNCTAD's estimates of $6 billion to much more depending on options and years.

KEYWORDS: Stabilization, buffer stocks, compensatory financing, ordinary least-squares, commodity agreements

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Analysis of Capital Requirements of the UNCTAD Integrated Programme for Commodities

Developing countries (LDC) have been pressing for a restructuring of the world economic system into a new world economic order. One of their aims is the establishment of the Integrated Programme for Commodities (IPC) which would stabilize commodity prices and export earnings of developing countries, primarily through international commodity arrangements. Buffer stocking schemes would be used to stabilize prices within a specified range for those commodities that are deemed suitable for stocking. Compensatory financing of their exports has been suggested by the developing countries as a way to support earnings for the non-stockable commodities.

The United Nations Conference on Trade and Development (UNCTAD) Secretariat has listed ten stockable commodities: cocoa, coffee, copper, cotton and cotton yarn, hard fibers and products, jute and products, rubber, sugar, tea, and tin (UNCTAD 1975 and 1976). The non-stockable commodities--those either too bulky or perishable--include bananas, bauxite, beef, iron ore, manganese ore, phosphate rock, tropical timber, and vegetable oils, including olive oil and oilseeds. These are all included in this study, with the hard fibers represented by sisal, hemp, and manila in the stockable list and the oilseeds represented by copra, coconut oil, groundnuts, groundnut oil, and palm oil in the non-stockables.

The UNCTAD Secretariat has estimated that investment requirement of $5 billion (1976 dollars) would be needed for the buffer stocking operation

and an additional $1 billion for other stocking and non-stocking activities (UNCTAD 1975 p. 7 and UNCTAD 1976).1/ Only $3 to 3.3 billion would be needed initially.

Theoretical-welfare considerations for stabilization via buffer stocks have been explored with impressive results for numerous situations by several analysts. Several of these are summarized and referenced by Jere Behrman, Jimmy L. Matthews, and Stephen J. Turnovsky. As Behrman has suggested, the theoretical solutions of simple cases point in various directions and really are not very relevant to the complex empirical questions on either past or future buffer stock operation results. Empirical analysis of the data--incomplete as they are--is essential, and this paper is concerned largely with such analysis of the record.

Three Stabilization Systems

Three alternative analyses were made for the period 1961-75: LDC compensatory financing for all commodities and export earnings stabilization and unit value stabilization for the stockable ones. The objective was to estimate the capital requirement of the proposed integrated program as if it had been in effect for the past 15 years.

The LDC compensatory financing scheme assumes that grants will be made to the LDC's whenever their export earnings are below the stabilization range. For the buffer stocking schemes the analyses are based upon a two region world

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1/ The 1975 study estimated $5.2 billion would be needed for the buffer stocking schemes and $0.88 billion for the remaining activities. The 1976 study estimated $4.5 to 5.0 billion would be needed for the buffer stocking schemes and $1.0 to 1.5 billion for the remaining activities.

trade model, with the Fund buying from exporters when unit values (or export earnings) are below the stabilization range and selling to importers when they are above the top of the range

The export earnings and price data were adjusted by the International Monetary Fund (IMF) index of export prices of all commodities in an effort to negate the effects of inflation. Real values are given in terms of 1970 dollars, except when comparisons are made with UNCTAD's estimates in 1976 dollars.

Principal Assumptions

Since actual export data are used, this implies that there is no producer supply response to the commodity price adjustment made by the central authority, and that no production or export controls are imposed. Further, the import demand curves were assumed to have constant price elasticity.2/

The simple method used here allows one to quickly determine the change in investment in stocks if one wishes to use a different price elasticity. If the price elasticity is reduced by one-half, e.g., -.5 to -.25, then the investment in stocks for that commodity is reduced by one-half.

It was also assumed at first that the actual world stocks that existed during 1961-75 did not affect unit values; later, this assumption was relaxed.

2/ Cocoa: -.4, coffee: -.25, copper: -.45, cotton: -.35, hemp: -.3, jute: -.5, manila: -.3, rubber: -.4, sisal: -.3, sugar: -.7, tea: -.3, tin: -.1. These elasticities are estimates of world demand price elasticities; therefore, the import demand price elasticities may be underestimated. If true, this will result in an underestimation of the investment requirements in buffer stocks.

Procedures

Ordinary least squares was used to establish a trend line for world export earnings and unit values for each commodity for the period 1961 through 1974 or 1975, depending upon the availability of data. There was no attempt made in these analyses to artifically raise or lower the trend lines.

Given the above assumptions, the cost of compensatory financing was calculated as the amount the export earnings for a given year were more than 2.5 percent below the export earnings trend for that year. If actual export earnings exceeded the trend earnings by more than 2.5 percent for any given year, the LDC's were allowed to retain the excess.

For the export earnings stabilization scheme, export earnings were stabilized $\pm$2.5 percent about the trend. This range required the buffer stocking facility to intervene in the market approximately 50 to 90 percent of the time.

For the unit value stabilization scheme, unit values were stabilized $\pm$5 percent about the trend which is roughly equivalent to a $\pm$10 percent range for the spot prices, which were more volatile. Market intervention appeared to be slightly less for this scheme than occurred in the export earnings stabilization scheme.

Results

LDC compensatory financing cost for the non-stockable commodities reached a maximum yearly cost of $631 million (in 1970 dollars) in 1974, table 1. To convert the 1970 values to 1976, multiply by 2.20.

The results from export earnings stabilization are very similar to those obtained from unit value stabilization; therefore only the

results of unit value stabilization are presented. The maximum investment in stocks when unit values were stabilized was $5.1 billion, table 2. Sugar and copper accounted for at least 80 percent of the needed investment every year during 1961-75. An investment in beginning stocks of $1.44 billion was needed to completely stabilize unit values ±5 percent about the trend of which $1.28 billion was sugar. The remaining 11 commodities required a beginning investment of only $0.16 billion.

With actual world stocks added in, buffer stock investment reached a peak of $11.5 billion in 1975, table 3. The smallest investment of $7.5 billion occurred in 1961, the first year.

The sugar unit value peak in 1975 appeared to reflect a large amount of inflationary speculation. Had a buffer stock operation been in effect this speculation would probably not have occurred. Thus, the inclusion of the 1975 unit value probably presents an upward bias in the trend line. Therefore, the sugar unit value trend line was recalculated for the period 1961-74, table 4.

The adjusted sugar unit value trend reduced the large accumulation of sugar centering on 1973 by aboout 50 percent. In 1974, when copper investment was small, the total investment for the 12 commodities was $1.7 billion, of which $1.1 billion was sugar (sugar, adjusted).

Conclusions

Our capital requirements calculation that is most nearly comparable with the UNCTAD $6 billion estimate for price stabilization covers the period 1961-74 and is around $5 billion (1976 dollars). If 1975

is included in the trend, the estimate is more than doubled to $11 billion (1976 dollars). The principal investment is in sugar and copper stocks, with the rest of the commodities slightly exceeding $1 billion (1976 dollars) in total. If existing world stocks held during the period are included, investment is again doubled to over $25 billion (1976 dollars).

Both stabilization of prices and of export earnings are mentioned as central aims of the IPC. But stabilization of the one does not necessarily stabilize the other. We tried both, and for the various commodities we got some differences in results, but the total requirements for the fund were about the same. In a majority of products stabilization of either prices or earnings resulted in some reduction in fluctuations for the other, but there was sometimes a destabilization effect.

An analysis of changes in operating rules and in years selected for trend fitting revealed wide variation in capital requirements. A principal difference in estimates is in the interpretation of stabilization. The two contrasting interpretations are: (1) Stabilization of real prices or earnings at the level they are at the beginning of the program or for a few prior years or (2) stabilization about a past or long-term trend to approximate an equilibium price. Since several commodities have downtrends, a few have uptrends and others just go up a spell and down awhile, the results are quite different from simple stabilization at a given level.

Another variable affecting capital requirements is the price series used. The major decision is between spot prices and average unit values for exports derived from trade value and volume. The spot

price seems the more obvious one to select, but the unit value may be analytically superior. We have tried both series; for about half the commodities, the two give equivalent results; for the others, the results are different, with the added complications of fluctuations about twice as large for spots as for unit values. Sometimes unit values lag spots by a year.

There is no agreement on the problem of the most appropriate, or logical trend calculation. It is very clear that the years or the system used to establish trend effect large variation in results obtained. As a consequence, there is no simple or logical trend selection system. Very plausible assumptions that seem quite reasonable can bring strange and even ridiculous results. A danger of this is that in the absence of a single, logical system for trend establishment, one may be chosen that will give huge benefits either to importers or exporters, depending on who gains control.

One danger which has trapped some simulators is getting stuck with substituting the prices established by the fund for market signals, e.g., a moving average or trend. What this does is to stabilize price permanently within a narrow range of either the trend or the level prevailing at the beginning of the fund's operation.

It seems legitimate--even appropriate--to use all the market signals available to calculate the "actual" price that would have prevailed in the absence of the fund's activities. For the historical period ("backcasting") one would try to forecast next year's price, using only data available in the current year; this will give calculated or "forecast" value which may be compared with the actual, and is more similar to the situation that would prevail in an actual fund operation.

Unfortunately, all this sound logic of using "the market signals and information system" has the opposite defect of using the price or earnings series established by the fund--little stabilization is achieved. Prices and earnings of the various stockable commodities occasionally rise 50 to 200 percent in a year or two, and they also fall precipitously. Using the market information price system has been tried for sugar and the results are disappointing. Sugar is admittedly a difficult commodity to stabilize but coffee, cocoa, and copper are in the same unstable price category.

The diversity in trends of prices and earnings of the stockable commodities precludes parallel treatment or relatively simple rules of thumb to improve each situation. For the few commodities with rising price trends, simple rules may often restrain prices and tend to benefit importers. For the majority of the stockable commodities, with declining price trends, buffer stock stabilization leads to difficulties. Stabilization of annual fluctuations about a down-trend is not very helpful in the long run, table 5. Stabilization of prices at a given level above the trend brings one-sided accumulation of stocks with little opportunity to sell, except at lower prices. To try to raise earnings by supporting prices of these commodities is a costly enedeavor.

Several considerations suggest that the Integrated Programme for Commodities (IPC) and particularly the Common Fund buffer stock proposals may not be the most effective way to help the LDC's develop. It seems that the more promising prospects for the LDC's development are to change from commodities and products with weak, declining demands to others that

have stronger, growing demands. It would seem to be to the advantage of all, that research and development effort be applied to those products with strong, growing demands for the LDC's to concentrate on, and for the DC's to open their markets to receive them. Although this may be a difficult route, requiring difficult adjustments, it is a more promising one for the UNCTAD objective of favorable prices for an expanding volume of exports.

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Table 1--LDC compensatory financing cost for UNCTAD commodities when export earnings are stabilized about the earnings trend during 1961-75 (1970 dollars)

Year	Total cost of stockable commodities[1]	Total cost of non-stockable commodities[2]	Total cost of all commodities
		$ Million	
1961	528	269	797
1962	385	230	615
1963	382	131	513
1964	325	91	416
1965	332	41	373
1966	386	68	454
1967	562	220	782
1968	541	146	686
1969	527	165	692
1970	319	104	423
1971	860	182	1,042
1972	1,247	320	1,567
1973	485	241	726
1974	829	631	1,460
1975	1,243	[3]471	[3]1,713

[1] Cocoa, coffee, cotton, hemp, jute, manila, rubber, sugar, sisal, tea, copper and tin.

[2] Alumina, bananas, bauxite, beef, coconut oil, copra, groundnuts, groundnut oil, iron ore, manganese ore, palm oil, phosphate rock, and timber.

[3] Does not include the metals, minerals, and timber. The export earnings trend for these three groups is for only 1961-74.

NOTE: Grants are made by the Common Fund when export earnings decline by more than 2.5 percent below the trend.

Data adjusted by IMF world export price index, 1970=100.

SOURCE: Actual export earnings obtained from 1975 FAO Trade Tape and Commodity Trade and Price Trends (1976 Edition), Report No. EC-166/76, World Bank, August 1976.

Table 2--Stocks needed to fully stabilize unit values ±5 percent about the trend 1961-75 (1970 dollars)

Year	Cocoa	Coffee	Cotton	Hemp	Jute	Manila	Rubber	Sugar	Sisal	Tea	Copper	Tin	Total
						$ Million							
Starting stocks required	0	79	32	0.0	8	2	4	1,277	22	5	6	1	1,436
1961	0	103	32	.2	0	1	0	1,024	22	7	587	9	1,784
1962	0	132	32	.2	3	1	0	1,024	22	7	1,122	16	2,358
1963	0	170	32	.2	37	1	0	499	10	7	1,653	23	2,432
1964	0	137	32	.2	46	0	0	0	0	7	1,653	19	1,893
1965	90	121	32	.2	46	0	0	101	1	7	1,367	8	1,772
1966	155	121	32	.1	46	1	0	433	6	7	906	4	1,710
1967	155	121	32	.1	46	2	27	1,012	17	6	825	4	2,246
1968	140	119	32	.1	38	3	65	1,659	32	6	568	4	2,663
1969	76	119	32	.1	31	4	46	2,106	43	6	287	4	2,752
1970	30	35	32	.2	28	4	46	2,592	62	6	0	4	2,834
1971	30	33	32	.2	23	4	70	2,996	81	4	56	4	3,332
1972	98	25	10	0	13	4	130	3,216	93	0	346	6	3,940
1973	105	0	10	0	13	4	60	3,452	90	7	204	6	3,951
1974	105	60	0	.3	36	3	6	3,119	78	33	305	0	3,744
1975	105	230	75	.3	46	3	25	2,373	75	33	2,154	13	5,132

Data adjusted by IMF world export price index, 1970=100.

Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by price stabilization.

Table 3--The required capital investment in stocks taking account of any significant world carryover stocks that would have been needed in a buffer stock operation if unit values are stabilized ±5 percent about the unit value trend 1961-75 (1970 dollars)

Year	Cocoa	Coffee			Cotton			Hemp	Jute	Manila	Rubber		
		Buffer requirement	Carryover[1]	Net	Buffer requirement	Carryover	Net				Buffer requirement	Carryover	Net
						$ Million							
1961	0	24	2,877	2,901	0	2,615	2,615	0.2	0	0	-4	[2]310	306
1962	0	52	3,137	3,189	0	3,067	3,067	.2	0	0	-4	310	306
1963	0	91	3,102	3,193	0	3,426	3,426	.2	34	0	-4	310	306
1964	0	57	3,085	3,142	0	3,797	3,797	.2	43	0	-4	334	330
1965	90	42	2,977	3,019	0	4,156	4,156	.2	43	0	-4	344	340
1966	155	42	3,734	3,776	0	3,598	3,598	.1	43	1	-4	347	343
1967	155	42	3,526	3,568	0	3,017	3,017	.1	43	2	23	374	397
1968	139	39	3,479	3,518	0	3,054	3,054	.1	35	3	61	368	429
1969	76	39	3,089	3,128	0	2,842	2,842	.1	28	4	43	406	449
1970	30	-45	2,825	2,780	0	2,642	2,642	.2	25	4	43	449	492
1971	30	-47	2,362	2,315	0	2,801	2,801	.2	20	4	67	452	519
1972	98	-54	2,375	2,321	-22	3,134	3,112	0	10	4	126	435	561
1973	105	-79	2,419	2,340	-22	3,306	3,284	0	10	4	57	485	542
1974	105	-20	1,770	1,750	-32	4,023	3,991	.3	33	3	2	486	488
1975	105	151	[3]2,133	2,284	44	2,987	3,031	.3	43	3	22	482	504

Continued -

Table 3--The required capital investment in stocks taking account of any significant world carryover stocks that would have been needed in a buffer stock operation if unit values are stabilized ±5 percent about the unit value trend 1961-75 (1970 dollars)--Continued

Year	Sugar			Sisal	Tea	Copper			Tin			Total
	Buffer requirement	Carryover	Net			Buffer requirement	Carryover[2]	Net	Buffer requirement	Carryover	Net	
	$ Million											
1961	-253	717	464	0	3	580	391	971	9	248	257	7,517
1962	-253	840	587	0	3	1,116	451	1,567	15	232	247	8,966
1963	-778	939	161	0	3	1,647	446	2,093	22	164	186	9,402
1964	[4] 1,040	1,040	0	0	3	1,647	306	1,953	18	169	187	9,455
1965	[4] 1,139	1,139	0	1	3	1,361	368	1,729	7	185	192	9,573
1966	-844	986	142	6	3	890	340	1,230	3	193	196	9,493
1967	-265	830	565	17	1	819	310	1,129	3	212	215	9,109
1968	382	837	1,219	32	1	562	353	915	3	272	275	9,620
1969	829	779	1,608	43	1	280	266	546	3	196	199	8,924
1970	1,315	724	2,039	62	1	-6	454	448	3	170	173	8,696
1971	1,719	768	2,487	81	0	49	450	499	3	190	193	8,949
1972	1,939	859	2,798	93	0	340	538	878	4	212	216	10,091
1973	2,175	906	3,081	90	7	198	289	487	5	172	177	10,127
1974	1,842	1,102	2,944	78	33	299	627	926	-1	167	166	10,517
1975	1,096	819	1,915	75	33	2,148	1,155	3,303	11	265	176	11,472

[1]These stocks were ending stocks for the crop year ending in the stated calendar year.
[2]These stocks were approximately 90 percent of the free world refined copper stock.
[3]Estimate.
[4]For full stabilization, a buffer stock valued at -1,277 and -1,176 million dollars for 1964 and 1965, respectively, would have been necessary.

Data adjusted by IMF world export price index, 1970=100.

Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by price stabilization.

Table 4--Value of stocks needed to fully stabilize unit values ±5 percent about the trend 1961-75 (1970 dollars)

Year	12 Commodities 1961-75	Sugar using 1961-75 trend	Sugar using 1961-74 trend	12 commodities using 1961-74 sugar trend	Copper using 1961-75 trend	11 commodities excluding sugar	11 commodities excluding copper	10 commodities excluding copper and sugar
				($ Million)				
Starting stocks required	1,436	1,277	686	845	6	159	1,430	153
1961	1,784	1,024	683	1,443	587	760	1,197	173
1962	2,358	1,024	748	2,082	1,122	1,334	1,236	212
1963	2,432	499	380	2,313	1,653	1,933	779	280
1964	1,893	0	0	1,893	1,653	1,893	240	240
1965	1,772	101	100	1,771	1,367	1,671	405	304
1966	1,710	433	349	1,626	906	1,277	804	371
1967	2,246	1,012	751	1,985	825	1,234	1,421	409
1968	2,663	1,659	1,160	2,164	568	1,004	2,095	436
1969	2,752	2,106	1,374	2,020	287	646	2,465	359
1970	2,838	2,592	1,560	1,806	0	246	2,838	246
1971	3,332	2,996	1,649	1,985	56	336	3,276	280
1972	3,940	3,216	1,649	2,373	346	724	3,594	378
1973	3,951	3,452	1,649	2,148	204	499	3,747	295
1974	3,744	3,119	1,079	1,704	305	625	3,439	320
1975	5,132	2,373	---	---	2,154	2,759	2,978	605

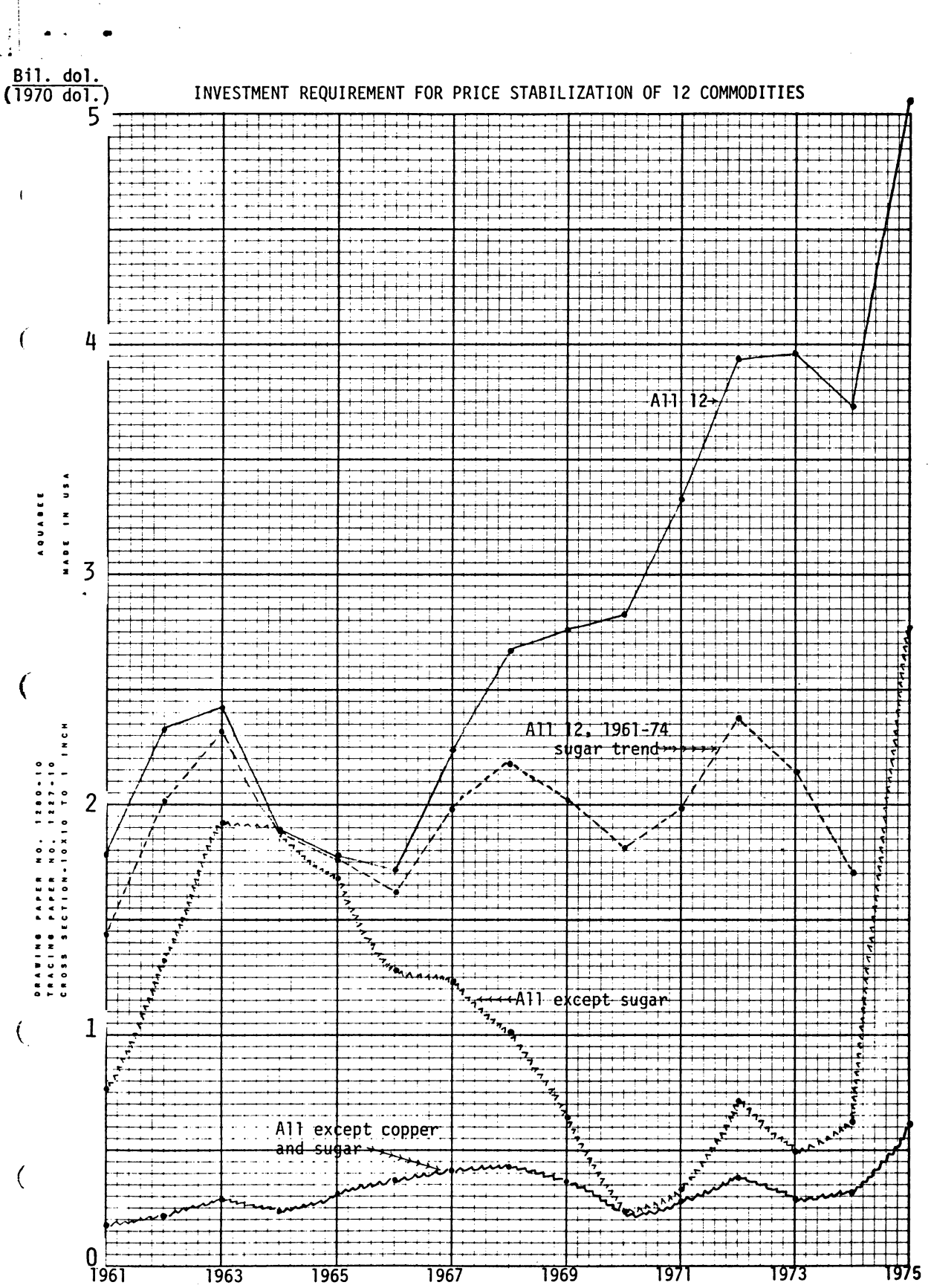
Data adjusted by IMF world export price index, 1970=100.

Stocks of each commodity valued at the average of their respective 1973-75 new prices (1970 dollars) that were generated by price stabilization.

Table 5--Export earnings effect from unit value stabilization, 1961-75 (1970 dollars)

Year	Cocoa	Coffee	Cotton	Hemp	Jute	Manila	Rubber	Sugar	Sisal	Tea	Copper	Tin	Net	Total +'s	Total -'s
							Million dollars								
1961	0	101	0	1	-38	-4	-19	-258	0	17	844	64	708	1,027	-319
1962	0	121	0	0	10	0	0	0	0	0	796	54	981	981	0
1963	0	159	0	0	81	-1	0	-703	-65	0	783	-35	219	1,023	-804
1964	0	-173	0	0	24	-4	0	-691	-53	0	0	-40	-937	24	-961
1965	147	-74	0	0	0	0	0	94	3	0	-838	-126	-794	244	-1,038
1966	113	0	0	-1	0	2	0	295	14	0	-1,635	-47	-1,259	424	-1,683
1967	0	0	0	0	0	4	90	493	27	-8	-198	0	408	614	-206
1968	-43	-13	0	0	-25	4	115	560	34	0	-712	0	-80	713	-793
1969	-204	0	0	0	-22	1	-69	425	26	0	-799	0	-642	452	-1,094
1970	-136	-437	0	0	-8	0	0	481	40	0	-809	0	-869	521	-1,390
1971	0	-9	0	0	-13	0	65	423	38	-11	115	0	608	641	-33
1972	132	-34	-70	-1	-30	1	137	255	26	-15	536	15	952	1,102	-150
1973	16	-113	-0	0	0	0	-233	281	-11	24	-362	8	-390	329	-719
1974	0	209	-29	1	33	-5	-164	-559	-67	73	207	-75	-376	523	-899
1975	0	514	184	0	16	0	40	-1,604	-13	0	1,986	104	1,227	2,844	-1,617
NET	25	251	85	0	28	-2	-38	-508	-1	80	-86	-78	-244	469	-713
TOTAL +'s	408	1104	184	2	164	12	447	3,307	208	114	5,267	245	5,103	11,462	
TOTAL -'s	-383	-853	-99	-2	-136	-14	-485	-3,815	-209	-34	-5,353	-323	-5,460		-11,706

Positive numbers are additional export earnings accruing to exporters as a result of unit value stabilization.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