ACCOUNTING FOR THE WORLD ECONOMY

BY ROB VOS

Institute of Social Studies, The Hague

The analysis of international trade, finance and adjustment is hampered by major statistical inadequacies. In theory current account balances of all economies that make up the world economy should add to zero. However, available balance-of-payments data and other major statistical sources show a huge discrepancy. A major source of the discrepancy is found in the inadequate recording of international financial assets and liabilities and related factor income payments. In this paper the author proposes a global economic accounting framework, labelled as the *World Accounting Matrix* (WAM), which integrates world investment-savings balances, trade flows, factor payments and international flow of funds into one consistent data system on a source-use basis. Data discrepancies can thus be traced and adjusted more systematically. The WAM will provide a new tool for studies on international trade, debt and adjustment and present the accounting framework and the consistent data basis for models of the world economy.

1. INTRODUCTION

In recent years, the LDC debt crisis, the large trade and fiscal deficits in the United States and the German and Japanese surpluses have made the issues of global interdependence in trade and finance of increasing concern. Although a large literature on the subject has emerged since the early 1980s, empirical analysis is seriously limited by major statistical discrepancies in the principal data sources. Global economic imbalances are usually measured first by approximation through the current account balances of the balance of payments of the countries and regions that make up the world economy. Consistent world economic accounting rules command that the sum of all current account balances should add to zero. However, according to the IMF Balance of Payments Statistics, the world current account has been in deficit over the past ten years. The "discrepancy" ran as high as 102 billion U.S. dollars in 1982; by 1986 this deficit was 65 billion U.S. dollars (see Table 1). In 1986 the discrepancy was almost four times the aggregate deficit recorded for industrialized countries and seven times the deficit registered for the group of non-oil developing countries. Table 1 also shows that global estimates derived from other data sources, e.g. national accounts show significant discrepancies, though with diverging patterns from those observed in the balance-of-payments data.

The reasons for the discrepancy may be multiple, but clearly they should be disentangled by detailing the different components of the current account (trade, factor payments, etc.) cross-checked by its capital account counter-parts (external financing, reserves, etc.) as well as by detailing for each country (or region) origin

TABLE 1

WORLD CURRENT ACCOUNT BALANCES

(billion U.S. $)

	Balance of Payments Data						National Accounts Data[1]				
	IC's	Oil-Exp	LDC's	CMEA	World bln U.S. $	% of Yw	IC's	Oil-Exp	LDC's	World bln U.S. $	% of Yw[2]
1975	19.8	35.4	−46.3	n.a.	8.9	0.2	30.8	31.6	−35.6	28.8	0.6
1976	0.5	40.3	−32.6	n.a.	8.2	0.1	13.1	36.5	−24.4	27.2	0.5
1977	−2.4	25.0	−25.1	−6.9	−9.4	−0.1	9.9	34.2	−30.7	15.4	0.2
1978	31.9	−0.7	−35.5	−3.5	−7.8	−0.1	45.3	21.9	−46.4	22.8	0.3
1979	−23.1	51.4	−45.0	−2.7	−19.4	−0.2	4.4	42.1	−39.9	8.5	0.1
1980	−60.5	95.9	−65.5	0.8	−29.3	−0.3	−22.7	56.2	−50.7	−15.2	−0.2
1981	−18.7	34.8	−83.2	−3.0	−70.1	−0.7	22.3	80.0	−87.8	16.4	0.2
1982	−22.3	−18.2	−68.8	2.4	−106.9	−1.1	24.0	59.2	−66.8	18.4	0.2
1983	−19.5	−19.5	−44.7	2.7	−81.0	−0.8	34.0	8.3	−39.2	5.1	0.1
1984	−58.5	−5.4	−28.4	4.8	−87.5	−0.7	6.8	−5.1	−8.8	−5.2	−0.1
1985	−51.4	3.0	−26.9	2.3	−73.0	−0.6	2.3	−6.7	−12.9	−15.3	−0.2
1986	−18.1	−37.9	−9.2	−0.2	−65.4	−0.5	−48.2	−10.2	−2.7	−59.1	−1.0
1987	−38.9	−11.9	−7.7	0.7	−57.8	−0.4	n.a.	n.a.	n.a.	n.a.	n.a.

Source: IMF, World Economic Outlook, various years (BoP data) and IMF, International Financial Statistics (National Accounts Data).
[1] Based on a sample of 108 countries. Current account balance calculated as a residual ($CA = S - I$).
[2] World GDP (Yw) corrected for sample size. IC's = industrialized countries (OECD); Oil-Exp = major capital-exporting oil exporters; LDC's = all other developing countries; CMEA = Socialist countries Eastern Europe.

and destination of external transactions. A major characteristic of existing data sources is that they record data supplied by the reporting country or agency without a systematic cross-check of international transactions at both the *source-* and *user-end*. The aim of this paper is to elaborate the methodology for an accounting framework that identifies sources and users simultaneously and, moreover, which integrates "real" (trade, savings, investment) and "financial" world economic variables into one system. The introduction of finance implies that the identification of both flows and stocks is relevant. In particular, international finance and investment do not only constitute a payments flow which is the counterpart of current account imbalances in balance of payments terms. As a stock variable they form the basis for factor income flows (interest, profit remittances). In fact, a recent IMF study on the world current account statistical discrepancy concluded that a major cause lay in the inadequate recording of international financial assets and related income flows (IMF, 1987a).

The global accounting framework presented in this paper, which is labelled as the *World Accounting Matrix* (WAM), shows how internal savings and investment balances, trade and factor payments and external financial transactions can be presented in an integrated matrix system, registering all entries on a source-user basis and allowing for a consistent treatment of stock and flow variables within the same data system. It will be argued that such a system of accounts allows for the integration of different data systems and a permanent cross-checking on statistical inconsistencies. This would lead to a substantial improvement in the reliability of the data on the world economy. After further elaboration the WAM could be used as an analytical instrument to study shifts in patterns of trade, debt and finance and could provide a data framework for global modelling.

The organization of the rest of this paper is as follows. The basic world accounting rules are explained in section 2, where it is argued that the key relations of the interaction between trade, finance and growth in the world economy are centered around the global investment-savings balances. Commodity balances and international flow funds become two sides of the same coin when pivoted around the global accumulation balance. Wealth accounts and stock variables of financial assets and liabilities are linked logically to the flow specifications. The simple balance sheets presented in section 2 are generalized in the WAM into a single-entry, matrix system of accounting presented in section 3. In Section 4 an estimate is given of a fairly aggregate WAM using 1980 data. It is shown how different data sources an be brought together, cross-checked and, eventually, adjusted. In the final section some general conclusions are drawn about the potential of the WAM framework.

2. GLOBAL MACROECONOMIC ACCOUNTING

2.1. The World Accumulation Balance

Standard national accounting rules state that, in the closed economy, total investment must equal total saving *ex post*. If this holds at the country level, then at the level of the world economy (which is, of course, a closed system), the sum of investments of all individual economies must equal total world savings. If one economy receives foreign savings, there must be another with excess national

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savings, such that, in a particular year, the sum of all ingoing and outgoing foreign savings or capital flows must add to *zero* on a world scale. National accounting conventions imply that this is the same as to say that, *ex post*, the sum of all current account deficits of the balance of payments must add to zero as well.

The following identities hold for the open economy:

Gross domestic product:

(1) $$X = C + I + E - M.$$

Gross national product and disposal of income:

(2) $$Y = X - R = C + S.$$

Accumulation balance:

(3) $$I = S + (M + R - E).$$

Foreign finance:

(4) $$FS = M + R - E.$$

where

> X = Gross domestic product
> C = Total consumption
> I = Total gross domestic investment
> E = Total exports of goods and non-factor services
> M = Total imports of goods and non-factor services
> Y = Gross national product (or income)
> R = Net factor payments and current transfers to abroad
> S = Total gross national savings
> FS = Net capital inflow or foreign savings.

In a North–South context the world is subdivided in its highest level of aggregation into two major country groups: the North (subscript N), composed of, say, the industrialized countries of the OECD, and the South (S), comprising the heterogeneous group of developing countries. In each region the *ex-post* macro-balance is established by the equality of the internal and external balances. The internal balance is defined by the investment-savings gap ($I - S$). A positive investment-savings gap ($I > S$) expresses an excess of domestic spending ($D = C + I$) over national income (Y). The external balance is the trade gap, imports (M) less exports (E), plus (less) net factor payments and current transfers to (from) abroad (R). Thus we define the external balance as the current account deficit of the balance of payments ($CA = M - E \pm R$). From the standard national accounting rules we derive the accumulation balances for each region as:

(5) $$(I_N - S_N) = (D_N - Y_N) = (\theta M_N - E_N - R)$$

(6) $$\theta(I_S - S_S) = \theta(D_S - Y_S) = (M_S - \theta E_S + R).$$

The variables are expressed in terms of the Northern (commodity) price level and currency, defining θ as the relative price level (eP_S/P_N; e = exchange rate

N–currency; P = price level) between the Southern and Northern economy. In a two-commodity world with complete specialization between North and South, θ could be interpreted as the terms of trade between the Southern and Northern commodity. In a two-region world Southern exports must equal Northern imports by definition ($\theta E_S = \theta M_N$) and *vice versa* ($E_N = M_S$). Further, external factor payments paid by the South equal by definition those received by the North. If both are valued at the Northern price, it holds that $R = R_S = -R_N$. From these identities it follows that the *ex-post* world accumulation, trade and factor payments balances must add to zero:

$$(7) \qquad (I_W - S_W) = (D_N - Y_N) + \theta(D_S - Y_S) = 0$$

where the subscript W stands for World, the sum of the Northern and Southern economy. The macroeconomics of the world economy is thus about the interactions of world investment and savings, the *ex-ante* world current account balance and the excess demand functions for the Northern economy (commodity) and that for the Southern economy (commodity).

A more detailed analysis merely requires a further disaggregation of the principal balance equations into (i) more country groups; (ii) separate economic sectors, specifying regional excess demand functions by major economic sectors: $\sum_j (D_N - Y_N)_j$; $\sum_j \theta_j(D_S - Y_S)_j$; $\sum_j M_{Nj}$, etc., ($j = 1, \ldots, n$); and/or, (iii) institutional sectors (e.g. public and private).

To illustrate how this can be done an institutional breakdown is shown to highlight the balance between private and public sectors and the link between government budget deficits and the current account:

$$(8) \quad (I_W - S_W) = (I_N - S_N)_p + DEF_N + \theta(I_S - S_S)_p + \theta DEF_S = CA_N + CA_S = 0.$$

The internal savings gaps in both regions have been split into a private sector $[(I_i - S_i)_p, i = N, S]$ and a public sector deficit (DEF_i), while CA_i represents the current account balance of each region. From equation (8) it follows for instance that, all other things being equal, expansionary fiscal policies in the North will lead to a corresponding *ex-ante* world current account deficit. To bring the world economy back into balance, either the private savings surplus in the North, or else the Southern economy will have to adjust. If the increase in Northern government spending is not (fully) compensated by an increase in the private savings surplus, the accounting tells us that internal and external balances in the South will require adjustment.

2.2. International Flow of Funds and Wealth Accounts

The basic accounting sytem can be completed by adding financial variables to the basic "real economy" relations. A strongly simplified world flow-of-funds system is presented in Table 2. It is assumed that the international monetary system is fully controlled by the North. On the basis of stylized facts we take it that reserve currencies are only created in the North and that the major international banks are located in the North and are under control of the Northern monetary authorities. The South may borrow and hold deposits in the international banking system, as well as that it may hold foreign reserve currency, but it cannot issue international money to finance domestic deficits.

TABLE 2

CONSOLIDATED WORLD FINANCIAL AND FLOW-OF-FUNDS SYSTEM

Change in Assets		Change in Liabilities	
International Financial System			
Commercial bank lending	ΔB	Bank deposits	ΔJ
Northern government debt	ΔDC_N	International currency	ΔH
North			
Investment-savings gap equals current account	CA_N	Bank credits	ΔB_N
Bank deposit holdings	ΔJ_N	Government debt	ΔDC_N
Cash balances North	ΔH_N		
Foreign aid and direct investment	ΔF		
South			
Investment-savings gap equals current account	CA_S	Bank cedits	ΔB_S
Capital flight, bank deposit holdings	ΔJ_S	Foreign aid and direct investment	ΔF
Foreign exchange holdings	ΔH_S		

The relevant financial balance equations can be derived from Table 2. The financial system comprises the central banks of the North and international commercial banks. On the liabilities side it has total bank deposits, J, and high-powered (international) money, H. Reserves for bank deposits would appear on both sides in this consolidated balance sheet and thus can be left out. On the asset side appear outstanding commercial bank loans (B) and government debt with the Central Bank (DC_N). In flow terms the balance sheets of the international monetary system are given as follows:

$$(9) \qquad \Delta B = (\Delta J + (\Delta H - \Delta DC_N).$$

The Northern economy finances its internal and external deficits $[CA_N = (I_N - S_N)_p + DEF_N]$ with bank credits and sales of government securities to the Central Bank. On the asset side, money demand takes the form of bank deposits (J_N) and cash holdings (H_N), while foreign aid (concessional loans) and direct investment (F) are taken as direct capital transfers to the South, i.e. they are not intermediated through the international financial system. The financial equilibrium of the Northern economy is given by the balance between the supply and demand for credit:

$$(10) \qquad \Delta B_N = (I_N - S_N)_p + (DEF_N - \Delta DC_N) + \Delta J_N + \Delta H_N + \Delta F.$$

Equation (10) shows the accounting relations between real and monetary variables in the North. The *ex-post* supply of commercial credits will have to balance with the private savings gap and the budget deficit which is not financed by drawing on Central Bank credits (or money creation). In the Southern economy the financial balance is established as:

$$(11) \qquad \theta(I_S - S_S) = CA_S = \Delta B_S + \Delta F - \Delta J_S - \Delta H_S.$$

Equation (11) can be seen as a presentation of the balance of payments. The items of the capital account are given on the right-hand side and include borrowing

on private credit markets (ΔB_S) and foreign aid and investments (ΔF) as sources of external finance. Acquisition of foreign assets by the South, particularly in the form of bank deposits, has become associated with capital flight in recent years. Estimates of the accumulated value of these assets indicate that these are of considerable size and of macroeconomic significance in a North–South context (see e.g. Deppler and Williamson, 1987; and also below). The final element in equation (11) is the use of foreign exchange reserves (ΔH_S).

The total supply of commercial credits is: $\Delta B = \Delta B_N + \Delta B_S$. Using this identity and (9) and (10) the accounting balance for the supply of credits to the South can be written in terms of the Northern financial balance:

(12) $\Delta B_S = \Delta J + (\Delta H - DEF_N) - [(I_N - S_N)_p + \Delta J_N + \Delta H_N + \Delta F]$.

Substituting (12) into (11) gives:

(13) $\theta(I_S - S_S) = CA_S = (\Delta H - DEF_N - \Delta H_N) - (I_N - S_N)_p - \Delta H_S$.

Equations (12) and (13) make clear by simple accounting rules how Southern growth (θI_S) and adjustment are directly related to the Northern fiscal/monetary policy mix ($\Delta H - DEF_N$) and portfolio decisions $[(S_N - I_N)_p - \Delta J_N - \Delta H_N - \Delta F]$.

The balance equations give the overall consistency framework for the analysis of international finance and global macroeconomic adjustment. They show how international financial relations are conceptually linked to the "real" economy, as reflected in commodity trade and domestic spending balances.

The *flow* variables of the accounting system also logically relate to a set of *wealth* and *stock* variables. This becomes immediately clear if one transposes the financial variables in Table 2 into assets and liabilities, instead of "changes in", by deleting the "Δ"-sign. As a result one obtains a system of real and financial wealth balance sheets for the world economy. In Table 3, I present such a system. Similar balance sheet accounts confined to single, closed and open, economies have been suggested by Tobin (1969; 1980) and Van Wijnbergen (1983).

New variables in this system are the capital stock (accumulated physical investment), K_i, for each region and net wealth, W_i ($i = N, S$). The stock of accumulated material wealth is interpreted here as all tangible assets that store economic value consisting of physical capital and various forms of (domestic and international) financial assets. Net wealth of each region therefore represents the total accumulated value of these assets less that of outstanding liabilities.

3. A World Accounting Matrix (WAM)

As indicated, the *ex-post* accounting identities can be extended in various directions, depending on the focus of the study and the degree of disaggregation required. With more country groups, commodities and institutions a double-entry balance sheet presentation like in Tables 2 and 3 becomes less appropriate. More suited is a single-entry matrix presentation. Such a system I will label as a *World Accounting Matrix* (WAM). National accounts and country level data have also been presented in single-entry systems, like input–output tables and social accounting matrices (on the latter see e.g. Pyatt and Thorbecke, 1976). However,

TABLE 3
CONSOLIDATED WORLD FINANCIAL AND FLOW-OF-FUNDS SYSTEM

Assets		Liabilities	
International Financial System			
Commercial bank lending	B	Bank deposits	J
Northern government debt	DC_N	International currency	H
North			
Physical capital stock	K_N	Bank credits	B_N
Bank deposit holdings	J_N	Government debt	DC_N
Money (cash) holdings North	H_N	Net wealth	W_N
Foreign aid (official loans) and equity holdings	F		
South			
Physical capital	K_S	Bank credits	B_S
Foreign financial assets and deposit holdings	J_s	Foreign aid (official loans) and equity holdings	F
Foreign exchange holdings	H_S	Net wealth	W_S

as yet no counterparts of such systems have been constructed for inter-country economic relations, with perhaps the exception of the Leontief regional input-output tables (Leontief, 1977). In any case, no framework is available that integrates trade, balance-of-payments, national-accounts and financial statistics for country groups, institutions and the international financial system.

In Table 4 an outline is given of how a WAM could be designed. On the columns one reads payments (or uses); on the rows: receipts (or sources). The sub-systems labelled as current account in Table 4 register world trade flows by regions and commodities (submatrices A_{12} and A_{21}) and net factor payments between regions and the international financial system (A_{22}, A_{23}, A_{32}). Submatrix A_{12} shows commodity imports per region; A_{21} commodity exports. Direct investment income, interest payments on official, bilateral loans, migrant labor income remittances, etc. would be registered in the block A_{22}, while factor payments on international financial liabilities owed to the international financial system by countries and non-financial institutions within countries are in A_{32} (interest payments) and those received from the ownership of financial assets in A_{23}. On the intersection of current and capital accounts appear national savings by country groups/institutions (A_{42}) and physical investment (A_{64}).

The international flow-of-funds structure identifies the way in which total investment per region (institution) are financed from national savings and international capital flows and can be found in the intersection blocks of the capital account (A_{44}, A_{45}, A_{54} and A_{55}). Identified in A_{44} are the sources and uses of *direct* capital transfers between non-financial institutions and country groups, i.e. those capital flows which are not intermediated through the international financial system. In this WAM presentation various types of capital flows are aggregated in this submatrix, including official development assistance, international bonds, direct private investment and trade credits supplied by non-bank institutions. The disaggregation of A_{44} for each of the relevant types of capital can, however, be presented in satellite tables. Sub-matrices A_{45} and A_{54} show capital transfers as intermediate through the international financial system, i.e.

in A_{45} one should find short- and long-term lending by commercial banks, central banks and other international financial institutions (e.g. the IMF could be introduced as a separate financial institutions), whereas A_{54} includes deposit taking by non-banking institutions in the different country groups (including capital flight money that is kept in the international banking system). Sub-matrix A_{55} registers inter-banking transactions.

The construction of a WAM for any one base-year is hindered by a number of serious statistical problems. First, the different entries have to be derived from different statistical sources, including balance of payments statistics, national accounts data, external debt data and international banking statistics, which at many points lack mutually consistent coverage, concepts and classifications and which, moreover, are obtained through different data collection methods. Second, except for merchandise trade statistics (UN, International Trade Statistics, IMF, Direction of Trade Statistics), little consistent information on a source-use basis is available for international de`t, payments and services. Balance of payments statistics compiled by the IMF, for instance, are only available on a *reporting* country basis and do not specify origin and destination of debit and credit items. International debt and banking statistics have traditionally focused on debtor positions, rather than on a consistent accounting of debit and credit positions. In recent years IMF international banking statistics (IFS) and Bank of International Settlement (BIS) statistics on external indebtedness have shown some improvement in this respect, but are still far too aggregate and incomplete to meet the requirements of the, apparently ambitious, set of accounts suggested by the WAM framework.

Third, savings and investment data by country and institutions are given in the national accounts (UN, National Accounts Statistics and IMF, International Financial Statistics). However, for most countries the macro-economic aggregates supplied within this system show little consistency with the corresponding estimates in trade and balance of payments statistics (exports, imports, current account balances). Fourth and finally, there appears to be even less consistency at the *aggregate* level, that is ingoing and outgoing international transactions fail to be netted out on a world scale. The most direct check is through the aggregate world current account balance as defined in equation (7), which should add to zero. From reported data it appears that this accounting rule is strongly violated, as was shown in Table 1. In fact, there has been a growing *ex-post* world current account *deficit*, running as high as 107 billion U.S. dollars in 1982, if based on balance of payments data. The relative importance of the discrepancy was also highlighted by the data in Table 1. The discrepancy was largest between 1981 and 1984, fluctuating between 0.7 and 1.1 percent of world GDP, which is about equal to the size of each of the three major shocks that affected the world economy since the early 1970s: the two oil crises of 1973–74 and 1979–80 and the progressive deterioration of the U.S. structural Federal budget position starting in 1981. Data presented in Table 1 also showed that the discrepancy is much less pronounced when based on national accounts data and defining the world current account deficit as the balance of world investment and savings $(CA_W = I_W - S_W)$. However, in this case coverage of the number of countries is smaller than in the former case and national savings data have already been derived as a residual.

TABLE 4

AN ACCOUNTING FRAMEWORK FOR WORLD TRADE, ACCUMULATION AND FINANCE

(A world accounting matrix—WAM)

		Current Account			Capital Account		
		1 Commodities /Prod. Act.	2 Regions (Country groups)	3 International Fin. Interm.	4 Regions (Country groups)	5 International Fin. Interm.	Total
Current Account	1. Commodities		World imports of regions by commodities A_{12}				World commodity exports
	2. Regions (Country groups)	World exports of regions by commodities A_{21}	Interregional factor payments; labour, and non-financial assets A_{22}	Factor income from financial assets A_{23}			Exports and factor income by region
	3. International financial intermediaries		Factor payments on financial liabilities A_{32}				Interests received by international financial system

		Inter-Regional Imports G and S	Imports, Factor Income and National Savings	Interests Paid by International Financial System	Total Financial and Fixed Investment and Other Capital Transfers	International Financial Liabilities	
Capital Account	4. Regions (Country groups)		Savings by region A_{42}		Direct capital flows between regions A_{44} Flow of funds	International borrowing A_{45}	Total available investment finance
Capital Account	5. International financial intermediaries				Financial investment and international reserves A_{54}	Inter-banking transactions A_{55}	International financial assets
Current Account	6. Commodities (Investment goods)				Fixed investment by region A_{64}		Total fixed investment
	Total						

I will not go into the major sources of the apparent statistical inconsistencies, but from more detailed studies (IMF 1987a; Vos 1986, 1988) the following conclusions can be derived:

(1) The major cause of the discrepancy is to be found in the inadequate recording of externally held financial assets and related income streams. This seems to hold in particular for developing countries, thus any study on the international financial relations should take account of this discrepancy and, where possible, make adjustments.

(2) Current account imbalances of deficit countries, particularly in a limited number of indebted, middle-income developing countries, probably are smaller than they appear from balance of payments statistics, while excess savings of some surplus countries, particularly industrialized countries with large holdings in the major off-shore banking centres, are most likely larger than reported.

(3) A large part of the discrepancy, apart from problems of coverage, is related to underrecording of *private* foreign assets. Given the size of the discrepancy, this also indicates the global macroeconomic importance of making an analytical distinction between, at least, public and private sectors at both source and user ends of international capital flows.

(4) The statistical problems underlying the world current account discrepancy stress the need for an integrated accounting framework that classifies all international transactions on a source and use basis, as well as, on the capital account items, on a stock and flow basis.

The IMF-study (IMF, 1987a) emphasized the conclusions as stated under points 1 to 3, but has not made recommendations to improve international statistics within a new WAM-like organizational framework, even though many of the detected flaws should logically lead to proposing such a system.

The indicated statistical problems may put a constraint on the construction of a WAM from existing data sources. However, at the same time, as I will try to point out, such an accounting framework may serve as a tool to resolve some of these problems and thereby contribute to a better understanding of world economic relations. In the next section I illustrate how a WAM can be constructed using existing data sources.

4. A WAM FOR 1980: AN ILLUSTRATION

As an illustration, a highly aggregated WAM with data for 1980 is presented in Table 5. The data problems previously discussed in Section 2 were all encountered during the process of compilation. Some of these could be eliminated by cross-checking entries from different data-systems, although some choice about which source was most reliable would always be required. A more detailed description of the different submatrices is given in Vos (1986). Here, only the core table is presented.

The WAM integrates four major data-systems (the principal data sources are between the brackets): (1) national accounts (IMF, *International Financial Statistics*); (2) international trade statistics (UN and UNCTAD); (3) balance of

payments statistics (IMF, *Balance of Payments Statistics*); (4) external debt reporting systems (World Bank, *World Debt Tables*; OECD/BIS, *Statistics on External Indebtedness*; OECD, *Financing and External Debt of Developing Countries*; IMF, *International Banking Statistics*).

In this exercise balance of payments statistics were used as the major reference system for overall consistency as it covers most of the transactions that are included in the WAM. Naturally, the world current account deficit had to be treated. At this stage no adjustments were made for discrepancies in the trade accounts; the size of the discrepancies appear on the bottom row of Table 5. A major adjustment was made, however, for interest payments on external debt after cross-checking available information on outstanding financial assets and liabilities for each region and interest payments and payments arrears, as explained further below. The international flow of funds was constructed from the various data systems that report on debt and financial assets and were then made to fit the adjusted current account balances.

On balance, as shown in Table 5, there remains an overall net statistical discrepancy of 14 billion U.S. dollars, which mainly relates to unadjusted discrepancies in trade in mineral products and services (shipping, etc.). The world current account discrepancy was about 30 billion U.S. dollars in 1980 according to IMF balance of payments data (See Table 1).

Some further insight in the structure of the WAM may be obtained by making a quick pass through the different submatrices.

Commodity trade balances (A_{12}, A_{21})

In submatrices A_{12} and A_{21} world trade by commodities and regions are presented. A six commodity classification is shown, distinguishing food products (SITC $0 + 1 + 22 + 4$), agricultural raw materials (SITC $2 - 22 - 27 - 28$), ores and metals (SITC $27 + 28$), fuels (SITC 3), manufactures (SITC 5 to 8) and services (including transport, trade, freight, insurance, travel, etc.). By far the major share of world trade takes place in the form of manufactures (excluding food) followed at a distance by fuels and services. Industrialized countries (IC's) absorb and generate about two-thirds of world trade flows. By presenting trade flows in matrix-form by source and use, the major deficit and surplus countries for each type of commodity, can be easily identified, i.e. for instance ICs are net exporters of food products, manufactures and services, but net importers of raw materials and fuels, whereas LDCs are net exporters of food products and non-fuel raw materials, but net importers of fuels and manufactures. At the present level of aggregation these are not surprising observations, but the presentation is meant to demonstrate how world interdependence can be consistently accounted for.

In deriving the commodity trade sub-system, trade matrices by country of origin and destination were constructed for each commodity group based on UN International Trade Statistics. The totals of the accounts for aggregate trade in non-factor services were derived from IMF Balance of Payments Statistics and the origin-destination matrix for trade in services was constructed by using the market share matrix for merchandise trade, with adjustments made for major maritime countries.

TABLE 5

WAM—WORLD ACCOUNTING MATRIX OF TRADE AND FINANCE, 1980

(Billion U.S. $)

	Current Account											Capital Account								
	Commodities						Regions				Oth.	Regions				Other Acc.				
	SITC						IC's	OPEC	LDC's	Soc	IBS	IC's	OPEC	LDC's	Soc	IBS	ΔR^1	Oth.^{2}		
	0+1 +22 +4	2−22 27−28	27+28	3	5 to 8															
	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3	4.1	4.2	4.3	4.4	5.1	5.2	5.3	Total	Net
Commodities: Current Account																				
1.1 Food products							135	23	32	29									219	—
1.2. Agr. raw mater.							51	3	9	10									73	—
1.3. Ores and minerals							32	1	3	4									40	—
1.4. Fuels							361	8	65	21									455	—
1.5. Manufacturers							748	127	169	111									1,155	—
1.6. Services							284	72	64	43									463	—
Regions:																				
2.1. Ind. countries	142	46	24	86	950	328	25	24	16	1	124								1,767	−70^{3,4}
2.2. Oil-exporting LDCs (OPEC)	4	4	1	312	9	23	2		1		19								375	+103^3
2.3. Non-oil LDCs	52	14	10	49	95	64		12			23								319	−17^3
2.4. Soc. countries	15	9	4	45	101	47					2								223	−3^3
Other:																				
3. International Banking System							143	15	31	7	3								199	+28^3

Regions: Capital Account

4.1. Ind. countries							1,702					45	20	4		53	5	92	1,921	−28[4]
4.2. Oil-exp. LDCs								277				12				22			311	—
4.3. Non-oil LDCs									289			39	12	1	1	41	11		394	—
4.4. Soc. countries										198						7			205	—
Other:																				
5.1. Int. Bank Sys.												81	42	4	1	104			235	+8
5.2. Change in int. reserves[1]													48						48	+32[2]
5.3. Other capital flows n.e.c.[2]													15	26	2				43	−49

Commodities: Current Account

6. Investment goods												1,772	174	359	201				2,506	
Statistical discrepancy	6	1	−37		1	56	−13												14	
Total	219	73	40	492	1,155	463	3,539	549	679	424	171	1,949	311	394	205	227	16	92		
Current Account Subtotal							1,837	272	390	226	171									

[1] "Expenditure" means increase in reserve position.

[2] Other short-term capital and errors and omissions.

[3] Current account deficit of balance of payments = [column totals (2.1 to 2.4) less savings] *minus* [row totals (2.1 to 2.4)].

[4] Net balance of international banking systems (3) is not included in ICs balance, but corresponding value should be added to ICs net current account transactions to obtain balance of payments figure; given the stylized fact that most international banks reside in ICs and that by far the major share of external transactions flow in and out of the region.

Factor Payments (A_{22}, A_{23}, A_{32}, A_{33})

Net factor income and payments have become an increasingly important item of the current account balances of most countries over the past decade and a half. In the years following the base year of the WAM presented here, factor payments abroad have exceeded trade balances (in many countries "forced" surpluses). According to Table 5, non-oil LDC's paid 31 billion U.S. dollars of interest payments to the international banking system (column 2.3, row 3), while the transfer of 16 billion U.S. dollars to industrialized countries (column 2.3, row 2.1) includes 9 billion dollars of interest payments on official, bilateral debt. However, at the same time, LDC's are estimated to receive about 23 billion U.S. dollars of interest income on foreign assets held in the international banking systems (column 3, row 2.3), an amount which is not accounted for in balance of payments statistics. Most financial transactions take place between industrialized countries; directly or intermediated through the international banking system. This is also reflected in the distribution of total interest payments as the bulk of these payments is concentrated in the financial centres of the world economy.

The interest payments accounts were constructed in relation to a set of debt-financial claim matrices specified by source and use for each type of major financial asset. Presented in Table 6 is an aggregated version of the debt-financial claim matrix for 1980 as it could be compiled from international banking statistics (IMF, BIS), external debt reporting systems (World Bank, OECD) and development assistance data (DAC/OECD). The debt-claim matrix also includes an estimate of private foreign assets ("capital flight") held by residents from developing countries in the international banking system. For 1980 the estimate for these assets, including official reserves deposited abroad, was 258 billion U.S. dollars,

TABLE 6

WAM: DEBT-FINANCIAL CLAIM MATRIX BY COUNTRY GROUP, 1980

(Billions of U.S. $)

Assets \ Liabilities	1	2	3	4	5	Total
1. Industrail countries	*	46	157		1,041	1,244
2. Oil-exporting countries	25		17		161	203
3. Non-oil developing countries			7		258	265
4. Socialist Eastern Europe and others		4	11		16	31
5. International fin. institutions[1]	993	108	286	60	26	1,473
Total	1,018	158	478	60	1,502	

Source: IMF, International banking statistics; World Bank, World Debt Tables; OECD, Development Cooperation 1983, 1984; OECD, External debt of developing countries, 1984; BIS/OECD Statistics of External Indebtedness. For a further disaggregation by type of financial assets and liabilities, see Vos (1986).

Note: Debt-Financial Claim = Outstanding disbursed debt and total value of financial liabilities at end of year. Includes long-term official development assistance and other official lending, export and suppliers credits, international bonds, bank loans and deposits, other cross-border short-term assets and liabilities. Excludes, international currency and reserve holdings; and direct foreign investments.

[1] Includes international commercial banks and multilateral institutions.

i.e. over 50 percent of outstanding liabilities (see Williamson, 1987, for similar estimates).

The flows of interest payments and receipts relates to the interest rate and asset structure of different types of wealth holdings:

(14) $\qquad INT_{ij} = \sum_s [i_{ijs} F_{ijs}], \qquad i = 1, \ldots, n, j = 1, \ldots, m, s = 1, \ldots, t$

where

INT_{ij} = Matrix of interest income and payments by region and banking institution of origin (i) and destination (j)

i_{ijs} = Matrix of average interest rates on oustanding debt and foreign financial assets by region and banking institution of origin (i) and destination (j) and by type of portfolio (s)

F_{ijs} = Debt-claim matrix of oustanding financial assets and liabilities by region and banking institution of origin (i) and destination (j) and type of portfolio (s).

Net interest payments between countries and regions can be derived, independently from balance of payments statistics by using data on interest rates and the debt-claim matrices. However, the derived information should be taken as indicative and accounts only for interest payments that are "due." Corrections will have to be made for arrears, commissions and fees, reschedulings, etc., which will affect the amounts actually paid. In Table 5 only corrections for payments in arrears were made.

Reinvested earnings of direct private foreign investment are also included in this sub-system and were derived from IMF balance of payments statistics. Additional information on the total outstanding stock of direct foreign investments (e.g. IMF 1985) was used to compile a complete matrix of reinvested earnings by origin and destination, assuming that there exists a direct relation between the distributive structure of direct investment and reinvested earnings by residence of ownership. Finally, donor country data were used to construct a matrix of official transfers by origin and destination, while selective information on migrant labor was used to allocate balance-of-payments totals of net workers' income remittances by country of origin and destination.

Current Account Balances

Trade flows, services and factor payments together constitute the current account of the balance of payments. By regions the current account balances can be derived as the difference between total current income (row totals of 2.1–2.4) and total current expenditures (column subtotals for submatrices A_{12}, A_{22}, A_{23} and A_{32}). The balances are given in the final column with the intersection with rows 2.1–2.4 and row 3. World current account balances should equal the investment-savings balances for each region as given in the blocks A_{42} and A_{46}. In Table 5 this consistency is obtained by adjusting national savings estimates derived from national accounts data to the balance resulting from gross regional investment and the adjusted current account balances derived through the WAM, i.e. $S_i = I_i - CAD_i$.

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International Flow of Funds $(A_{44}\ A_{45},\ A_{54}\ and\ A_{55})$

The flow of funds matches savings deficits and surpluses between the distinct regions. The structure of flow of funds bears a relation to the structure of outstanding international debt-claims (F_{ijs}) and the construction of the flow of funds goes simultaneously with that of the debt-claim matrices, including one for direct foreign investment $[\Delta F_{ijs} = (F_{ijs})_t - (F_{ijs})_{t-1}]$.

Residual use of capital and statistical discrepancies in capital flows have been identified in the WAM on separate accounts for change in reserves (5.2) and net errors and omissions (5.3).

The WAM presented here is meant for expositional purposes only. Although it was constructed on the basis of existing data resources, the data should be considered purely indicative. More refined methods will have to be applied to obtain a more reliable and disaggregated WAM. The table presented here used mainly aggregate data in the form compiled by some suppliers of statistics. Differences in coverage and classification between the data sources could not always be entirely corrected.

Despite these shortcomings it shows the usefulness of compiling statistics in such an integrated framework, as it forces the WAM-builder to maintain a continuous check on inconsistencies between sources and uses of funds.

5. CONCLUDING REMARKS

The study of the role of international finance in the process of global adjustment requires an appropriate accounting framework. In this paper it has been argued that such a framework should be centered around the processes that determine the *ex-post* balancing of global investment and savings. In such a framework the role of *net* capital flows are emphasized in a logical structure that links financial and "real-economy" variables across countries and institutions. Many studies on international finance and the international debt problem seem to have lost sight of these interrelations as they look at isolated data and indicators such as the overall growth of financial markets, total debt or debt service ratios. Recently, work has been initiated at the World Bank applying a similar approach to come to consistent global economic accounts, albeit not fully pursuing *source-user* specification for all variables (see McCarthy, *et al.* 1989).

The accounting system elaborated in this chapter is important for both analytical and statistical reasons. First, a consistent accounting framework should underly any model on the world economy, on international trade and financial interdependence. The international flow-of-funds system and the world trade and accumulation balances do not indicate cause and effect of changes over time. However, any analysis of *ex-ante* relations should end up with *ex-post* balances. These should hold for any level of disaggregation as forced by the single-entry, matrix-format accounting system implied by the WAM. The framework also defines the link between the net external (deficit or surplus) position of any institutional sector, country or country group and (changes in) the level and composition of the *stock* of assets and liabilities held by that sector, country or country group. Stock adjustments in one part of the system must have a corresponding counterpart elsewhere. The importance of stock-flow relations are

frequently neglected in studies of international finance, while the focus of global models has been on flow–flow relations (cf. Richard 1985; Hicks, *et al.* 1976; Gupta, *et al.* 1979; Tims and Waelbroeck 1982). The accounting framework presented here allows for a consistent treatment of flows and stocks which will be advantageous for the modeling of international finance, since important dynamic determinants of international financial relations, such as "debt over-hang," interest rates and the dollar exchange rate, are essentially "stock" problems.

Secondly, one could emphasize two statistical advantages of the construction of a system of world accounts within a WAM framework:

  (i) the mobilization and integration of different data resources that otherwise might seem fragmentary;

  (ii) a logical and permanent check on data consistency and coverage, par-ticularly because the WAM-system forces consistency for origin and destination of each entry for commodity flows and changes in domestic and international assets and liabilities.

The large discrepancy in the world current account balance, and thus in the aggregate investment-savings balance, to a large extent relates to problems in the accounting of international capital flows. This emphasizes the need for a framework that treats internal and external balances, trade and financial flows and foreign assets and liabilities across countries simultaneously. This seems to be the contribution that the application of a WAM framework could make toward a better understanding of the world economy.

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