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Monetary and Financial Statistics:

Compilation Guide

Chapter 6. Money, Credit, and Debt

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Introduction

6.1 This chapter covers a variety of issues pertaining to currency, deposits included in or excluded from the national definition of broad money, the monetary base, and credit and debt aggregates.

National currency

General principles

Currency consists of notes and coins that are of fixed nominal values and are issued by central banks or governments. Currency is divided into separate categories for national currency and foreign currency representing liabilities of central banks or governments in other countries. ***MFSM*, ¶124**.

Central bank or central government holdings of unissued or demonetized currency are **recorded as nonfinancial assets** in sectoral balance sheets. **Demonetized currency should be removed from the balance sheet upon disposal. *MFSM*, ¶126.**

[The bolded text does not appear in the *MFSM* and has been added for clarification or correction.]

6.2 This guide uses several concepts in describing the creation and use of national currency:

- *Issuance of currency*. The incurrence of a debt obligation for currency that is placed in circulation in the economy. The *currency issuer* is the institutional unit that records the currency as a liability in its balance sheet.

- *Placement of currency in circulation.* Distribution of newly issued currency to holders outside the central bank (including financial corporations, other sectors, and nonresidents).

- *Currency in circulation*. The amount of currency *issued by* the central bank and *held by* resident sectors and nonresidents. Currency in circulation consists of all currency issued by the central bank *less* currency held as vault cash in the central bank.[1]

- *Currency replacement*. Substitution of new national currency notes for old national currency notes, or new coins for old coins. Currency replacement involves the substitution of "new paper" for "old paper" or, in the case of coins, "new metal" for "old metal," if the new currency notes or coins have the same

[1] *Currency in circulation* is the currency account in the liability section of the *Central Bank Survey* (see Table 7.8 in Chapter 7, Annex 7.3).

nominal value (even if not the same denominations) as the old notes or coins.[2] In a different context, *currency replacement* can refer to "dollarization" of an economy, when national currency is replaced by foreign currency as the principal medium of exchange and national unit of account.[3]

- *Currency outside depository corporations*. Currency in circulation *less* currency holdings (vault cash) of ODCs.[4]

- *Currency component of monetary aggregates.* The sum of *Currency outside depository corporations* and, if applicable, currency issued by central government and/or nonfinancial corporations.[5]

Central bank and other depository corporations

6.3 In the majority of countries, *issuance of currency* is an exclusive right of the central bank, and *placement of currency in circulation* is mainly or entirely channeled from the central bank through the ODCs and to the money holding sectors of the economy.[6]

6.4 The amount of currency placed into circulation is determined by ODCs' demand for vault cash and their customers' demand for currency notes and coins.[7] Currency is placed into circulation when it is transported from the central bank to an ODC,

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[2] The only accounting entries are those related to a reduction in nonfinancial assets—the category in which the new notes or coins were recorded prior to the new currency being distributed and the old currency being destroyed.

[3] See ¶14 in this chapter.

[4] *Currency outside depository corporations* is the currency liability shown in the *Depository Corporations Survey*. Holders include the central government and nonresidents, as well as those distinguished as *money holders* (*MFSM*, ¶316). The central bank's liability for currency in circulation is equal to the total amount of currency issued by the central bank *less* the central bank's own holding of national currency.

[5] An exception applies to "dollarized" economies (see ¶16-17 in this chapter). In these countries, *Issuance of currency*, *Currency outside depository corporations*, and *Currency component of monetary aggregates* pertains to foreign currency, which is issued by a nonresident government.

[6] Historically, currency sometimes was issued by ODCs—for example, during the "wildcat banking" era in the United States in the 1840s. Today, *issuance of currency* by ODCs is confined to (1) two jurisdictions within the United Kingdom—Scotland and Northern Ireland—and (2) Hong Kong, Peoples' Republic of China. *Issuance of currency* by ODCs in these jurisdictions is matched by ODC deposits of convertible foreign currency (equivalent in value to the currency issued) in the Bank of England and the Hong Kong Monetary Authority, respectively. This mechanism is tantamount to issuance of currency by the central bank.

[7] Through direct transactions with institutional units in the money holding sectors, a central bank sometimes accounts for a relatively small direct placement of *currency outside depository corporations*.

accompanied by the appropriate accounting entries.[8] The currency becomes *currency outside depository corporations* when ODCs' customers in the money holding sectors exchange deposits for currency.[9]

Central government

6.5 A central government may issue coins and/or national currency notes that account for all or only part of the total currency in an economy. The central government most commonly issues the coins, and the central bank issues the currency notes.

6.6 Though the central government incurs a liability for *issuance of currency*, the central bank often has sole responsibility for the *placement of currency in circulation*. A central government purchases the currency from a domestic or foreign mint (or bureau of engraving) and delivers the currency to the central bank. In the central bank's accounts, the nominal (face) value of the currency is recorded as vault cash (*Currency – National*), along with a corresponding increase in the central bank's liability (*Transferable deposits - In national currency*) to the central government.[10]

6.7 Issuance of this currency, though not a liability in the *Central Bank Survey* or *Depository Corporations Survey*, enters the monetary statistics as a separate component of broad money (see *MFSM*, Box 6.1, p. 58). Obtaining data on the issuance and subsequent circulation of the currency is the main concern of monetary statistics compilers. In many cases, the data are directly available in the central bank's records of the transactions described in the preceding paragraph. *This guide recommends that the central bank data be used, if the data are know to be comprehensive.*

6.8 In principle, the central government can place some of the currency into circulation through direct transactions with institutional units in the money holding sectors.[11] *This guide recommends that, in the presence of such direct distribution of currency, the central government be requested to provide data on its total currency*

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[8] The ODC records an increase in *Currency - national* and a decrease in its transferable deposit holdings at the central bank. The central bank records the reduction in the ODC's transferable deposits and either a reduction in the central bank's holding of currency that was previously issued or, for a new issuance of currency, (1) a reduction in nonfinancial assets (unissued currency valued at cost) and (2) revenue equal to the nominal value of the currency *less* the cost of the currency.

[9] The currency/deposit composition of broad money is determined by the money holding sectors. Upon demand from its customers, an ODC stands ready to reduce its vault cash in exchange for a reduction in customers' transferable (or savings) deposit holdings at the ODC.

[10] Through this transaction, the central government obtains the *seigniorage* from issuance of the currency—the net revenue equal to the difference between the nominal value of the currency and the cost of acquisition and distribution of the currency.

[11] For example, the central government could distribute the currency notes in making cash payments to suppliers of government goods and services. The central government might distribute coins to the household sector, for example, in the course of conducting cash transactions with individuals acquiring licenses or paying other government fees.

issuance on a monthly basis. The central government should be advised that any currency in its treasury stock (in inventory but not yet distributed) should be excluded from the data provided to monetary statistics compilers.[12] To verify the consistency of the records of the central bank and central government, it may be useful to request monthly reporting of central government's issuance of currency, even if all issuance supposedly is reflected in the central bank's records.

Commemorative coins

Some countries issue gold coins, which are held for intrinsic value, or commemorative coins, which are held for numismatic value. If not in active circulation, such coins should be classified **by the holder** as nonfinancial assets rather than as financial assets, **and within Other accounts payable by the seller/issuer**. ***MFSM*, ¶125**.
[The bolded text does not appear in the *MFSM* and has been added for clarification.]

6.9 Commemorative coins often are minted from precious metal, are packaged in fancy covers and cases, and are sold at prices well above the nominal (face) value. However, commemorative coins sometimes are produced in less expensive form and are sold at or near the face value. These coins qualify as legal tender and sometime are used as a medium of exchange by those for whom purchase of a good or service outweighs the value of possessing the coin (particularly when a coin commands a premium over nominal value).

6.10 *This guide offers alternative approaches to accounting for the sale/issuance of commemorative coins.* The central bank can view the sale of the coins as simply a commodity transaction.[13] It may be impractical to include the value of any portion of the commemorative coins in broad money, even if a few of the coins are expected eventually to appear (at least temporarily) as a medium of exchange. Alternatively, when sold by the central bank, the coins can be recorded at nominal (face) value in the miscellaneous category of *Other accounts payable – other*.[14]

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[12] For most countries, the currency component of broad money includes the central government's holding of currency. The central government's holdings of currency that has already been placed in circulation—whether issued by the central government or the central bank—can be included or excluded from broad money, as a matter of national choice. However, unissued currency should invariably be excluded for all data on currency in circulation.

[13] Having acquired the coins from the mint, the central bank records them at cost in nonfinancial assets. Suppose the coins are acquired at a cost of **10**, and are sold for **100** in exchange for currency notes. The central bank would record an asset of **100** (currency received), nonfinancial assets of **-10** (commemorative coins from inventory at cost), and revenue of **90** (profit on sale of coins). The coins thereby disappear from the balance sheet of the central bank.

[14] Using the example in the preceding footnote, suppose that the coins have a face value of **50**. When the coins are sold, the central bank records an asset of **100** (currency received), nonfinancial assets of **-10** (coins from inventory at cost), a liability of **50** within *Other accounts payable - other* (commemorative coins at face value), and revenue of 40 (profit on sale of coins). The central bank's liability for the nominal value of the commemorative coins thereby remains on the balance sheet.

6.11 The amount of currency being used as a medium of exchange is overstated by the nominal value of any coins and currency notes that have been withdrawn by collectors, who value specific notes or coins for their age or rarity. The overstatement is usually considered insignificant and is ignored in the national definition of broad money.

Foreign currency

General principles

6.12 Foreign currencies serve two functions in all countries:

- *Store of value*. Foreign currency notes and coins, which are easily transported into and out of a country, are held by all sectors of an economy. Holdings of currency notes and coins issued by foreign countries constitute a separate category of claims on nonresidents in the sectoral balance sheets of the financial corporations, as well as in the balance sheet of institutional units in the nonfinancial sectors.

- *Foreign unit of account*. Institutional units in the various economic sectors hold foreign-currency-denominated assets—deposits, loans, securities other than shares, and financial derivatives. Depository corporations in many countries accept foreign-currency-denominated deposits and make foreign-currency-denominated loans. Corporations and governmental units sometimes issue foreign-currency-denominated securities other than shares and may have foreign-currency-denominated positions in financial derivatives and other accounts receivable/payable.

6.13 Foreign-currency-denominated assets and liabilities may be claims on and liabilities to residents or nonresidents. Foreign-currency-denominated deposits that depository corporations accept from money-holding sectors usually are included in national definitions of broad money. All foreign-currency-denominated claims on and liabilities to nonresidents should be classified as foreign assets and foreign liabilities, respectively, regardless of the functions that foreign currencies serve in the economy.

6.14 Foreign currency serves additional functions in several countries. In some countries, a foreign currency is the only or principal medium of exchange,[15] and the foreign currency unit is used as the national unit of account. These countries are referred to as *"dollarized" economies*, regardless of whether the U.S. dollar or some other foreign currency (such as the Euro) is the foreign currency that serves as the medium of exchange and the national unit of account.[16] Dollarization has implications for the measurement of

[15] The national currency in circulation in these countries is limited to coins issued by the central bank or government and, in some countries, old national currency notes not yet removed from circulation.

[16] The dollarization in Panama has a minor exception. The national currency unit is the Balboa, which is on a par with the US dollar. The foreign currency unit (i.e., US dollar) is tantamount to being the national currency unit of Panama. Coins denominated in Balboa (but not Balboa notes) are in circulation.

monetary aggregates in an economy and for the classification of financial assets and liabilities in the sectoral balance sheets of financial corporations.[17]

6.15 Some countries use their own national unit of account, but permit both national and foreign currency to serve as media of exchange. These countries are described as having *currency co-circulation*. Currency co-circulation has implications for the measurement of the monetary aggregates in an economy, but does not affect the classification of financial assets and liabilities in the sectoral balance sheets of financial corporations.

Dollarization

6.16 During the transition to a dollarized economy, the following actions are taken:

- The financial records of institutional units in all sectors of the economy are converted from the national unit of account to U.S. dollars (or other foreign unit of account) at an exchange rate announced by the central bank or government.

- National currency notes are withdrawn from circulation, either gradually or within a pre-announced period in which currency holders are entitled to exchange the national currency for US dollars (or another foreign currency) at the pre-announced exchange rate.

6.17 Dollarization of an economy is reflected in the following accounts in the sectoral balance sheets and surveys of the financial corporations:

- *Currency in circulation*. After dollarization is completed, this liability account of the central bank shows only the amount of national-currency-denominated coins and old national currency notes, if any, that are still in circulation.

- *U.S. dollar (or other dollarization currency) notes and coins.* Holdings of the "dollarization currency" are included in the same category as holdings of other foreign currencies; all holdings of the dollarization currency and other foreign currency are classified as claims on nonresidents (foreign assets).

- *Financial asset/liability disaggregation by currency of denomination.* In the sectoral balance sheet in Table 7.1 of the *MFSM*, deposits are disaggregated into separate categories for *"In national currency"* and *"In foreign currency."* For a dollarized economy, the subcategory of *"In national*

[17] This guide uses a narrower definition of "dollarization" than literature in which "dollarized" refers to any country in which foreign-currency-denominated assets and liabilities are prevalent, even when national currency is the medium of exchange and unit of account. By that definition, most countries would be classified as "dollarized."

currency" should be reinterpreted as *"In the national unit of account*."[18] The distinction between *"In national currency*" and *"In the national unit of account"* for a dollarized economy is important for adherence to the definition of official international reserves, which excludes all *national-currency* assets.

6.18 For a dollarized economy, the financial assets denominated in US dollars (or another dollarization currency) are *In the national unit of account* but not *In national currency,* because the term *national currency* does not apply to a currency issued by a nonresident unit. The US dollar is the *national currency* of only the United States (wherein all US-dollar notes and coins are issued within the Federal Reserve System). However, in the sectoral balance sheets in a dollarized economy, all deposits denominated in US dollars (or another dollarization currency) should be classified as *In national currency*, which is reinterpreted as *In national unit of account*, and all deposits denominated in other foreign currencies are classified as *"In foreign currency."*

6.19 The same classification principle applies to other categories of financial assets and liabilities. All loans, securities other than shares, and financial derivatives denominated in US dollars (or an alternative "dollarization" currency) are classified as *In national currency*, which is reinterpreted as *In national unit of account*; those denominated in other foreign currencies are classified as "*In foreign currency*."

Co-circulation

6.20 In some countries, foreign currency is allowed to co-circulate with national currency. The foreign currency serves as a medium of exchange and store of value, and the national currency continues to serve as a medium of exchange, store of value, and the national unit of account. The circulation of foreign currency (often the currency of a major trading partner) together with circulation of national currency is common in regional monetary integrations in which member countries retain their national currencies. The currencies are allowed to co-circulate freely within a single economy wherein each currency serves as the medium of exchange, and the national currency remains the national unit of account. Co-circulation may be legally sanctioned, or may be permitted as an informal practice that is clearly acceptable to the national authorities.[19] Co-circulation may involve the use of two or more foreign currencies, along with the national currency, as media of exchange.

6.21 Co-circulation of foreign currency does not affect the classification of the accounts in the sectoral balance sheets of the financial corporations or in the balance sheets of the other institutional units in the economy. The characteristics of currency in these countries are:

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[18] On reserve assets as *foreign claims*, see the relevant International Monetary Fund (1993), ¶424-430; and Kester (2001), ¶66-67.

[19] Co-circulation is distinguished from black-market trading, which involves the surreptitious buying and selling of foreign currency in violation of national laws or regulations that are enforced.

- *Unit of account*. The financial records in all sectors of the economy continue to be based on the national currency as the standard unit of account.

- *Currency in circulation*. The central bank's account for currency in circulation shows its liability for the outstanding amount of national currency that it has issued. Liabilities for the co-circulating foreign currency appear only in the records of the foreign central bank or central government that issued the currency.

- *Co-circulating notes and coins.* Holdings of the co-circulating foreign currency continue to be included in the same category as holdings of other foreign currencies, wherein all foreign currency is classified as claims on nonresidents (foreign assets).

- *Financial asset/liability disaggregation by currency of denomination.* All financial assets and liabilities denominated in a foreign currency (whether or not a co-circulating foreign currency) are classified as *In foreign currency*.

6.22 Currency co-circulation may be combined with dollarization, as in the case of the monetary integration arrangement of the Common Market Area (CMA) in southern Africa. Rand is the national currency of South Africa, as well as a co-circulating currency in the other CMA countries—Lesotho, Namibia, and Swaziland. Each of these countries has a national currency that, along with rand note and coins, serves as a medium of exchange and the national unit of account. However, the national currencies (Lesotho loti, Namibia dollar, and Swaziland lilageni) have exchange rates that are pegged to the South African rand, which make the rand akin to a national unit of account. Under the monetary arrangements, all CMA members share the seigniorage that South Africa obtains from the issuance of rand notes and coins.

Currency-union currency

6.23 In a currency union, the union-wide currency is issued by a supranational central bank such as the European Central Bank (ECB), East Caribbean Central Bank (ECCB), and the central banks of the CFA franc[20] areas—Banque Centrale des Etats de l'Afrique de l'Ouest (BCEAO) and Banque de Etats de l'Afrique Centrale (BEAC). The union-wide currency serves as the medium of exchange and national unit of account in each of the member countries of the union. Several actions apply to each country in the currency union:

- For the transition to the union currency, a fixed exchange rate between the national currency and the union currency is announced.

[20] Franc de la Communauté Financière d'Afrique (franc of the African Financial Community) for the West African Economic and Monetary Union member states, and franc de la Coopération Financière en Afrique Centrale (franc of Financial Cooperation in Central Africa) for countries belonging to the BEAC area.

- National currency notes and coins are withdrawn from circulation, either gradually or within a pre-announced period.

- The financial records of institutional units in all sectors of the economy are translated into union currency units, which is the new standard unit of account.

- Notes and coins denominated in the union currency are placed in circulation by the central banks of the union-member countries.

6.24 The introduction of the union currency in an economy is reflected in the sectoral balance sheets and surveys of the financial corporations of each union-member country

- *Currency in circulation*. This liability account of the central bank shows the amount of union-currency notes and coins issued by (or treated *as if* issued by) the central bank, as well as the amount of national currency issued earlier by the national central bank and not yet removed from circulation.

- *Union currency notes and coins.* Union currency notes and coins are classified as "*In national currency.*"

- *Financial asset/liability disaggregation by currency.* In the sectoral balance sheet in Table 7.1 of the *MFSM*, deposits are disaggregated into separate categories for *"In national currency"* and *"In foreign currency."* For economies participating in a currency union, *"In national currency*" must be interpreted as *"In the currency-union unit of account."* All union-currency-denominated assets and liabilities are classified as *"In national currency."*

Estimation of currency-union currency

Difficulties arise in estimating the currency in circulation in the individual member countries of a currency union. Currency issued by the regional central bank headquarters and/or the national central banks within a currency union circulates as legal tender throughout the union, making it difficult to estimate the amount of the currency that is in use in each member country. ***MFSM* ¶292.**

6.25 The *MFSM* highlighted the difficulties of estimating the amount of union currency in circulation in individual countries belonging to a currency union. However, similar problems arise for the estimation of the amount of foreign currency that circulates in a dollarized economy, or co-circulates along with a national currency. In each case, the basic problem is the lack of data on cross-border currency flows that do not appear in financial corporations accounts and generally are not reported from other sources to the monetary statistics compilers.

6.26 Estimation and compilation practices for currency in circulation differ across the currency unions. For the European Monetary Union, each national central banks records Euro banknote liabilities in an amount equal to its share of the total Euro banknotes issued for the entire currency union. Each country's share is calculated in proportion to the amount of its equity share in the European Central Bank *plus* coins issued by the

national central bank *less* the amount of Euro currency notes and coin held by the monetary and financial institutions (ODCs) in the country.[21]

6.27 The Eastern Caribbean Central Bank has the exclusive right to issue the currency notes and coins of the Eastern Caribbean Currency Union (ECCU). The ECCU member countries do not have national central banks, and the currency is placed in circulation through the ODCs in these countries. The amount of currency issued in each member country is based on each country's equity share in the ECCU. All currency notes and coins are marked with a specific letter to designate the country of issue. Notes and coins spent in another member country are eventually repatriated to the member country of issue.

6.28 For the CFA countries, which are members of BCEAO and BEAC, currency issuance for a member country is in proportion to that country's equity share in the union-wide central bank. The currency notes and coins issued for a member country are imprinted with the country name and a national symbol, which facilitates the repatriation of notes and coins that circulate outside the country of issue.

Estimation of dollarization and co-circulation currency

6.29 Various techniques can be used to estimate the amount of foreign currency in circulation in dollarized economies and countries in which currency co-circulation is extensive. Estimation methods can be based on surveys of currency holding, historical information about currency holdings, and econometric techniques. Similar techniques apply to the estimation of national currency outflows from countries that provide the dollarization or co-circulation currency to other countries.[22]

6.30 Collection of survey data on currency flows across the national border is a first step in estimating the currency in circulation in a dollarized economy Surveys typically cover currency transactions within the banking system, or are customs-type reports of currency carried by travelers. In some countries, statistical estimates of international flows of currency are constructed through netting of outflows and inflows associated with balance of payments transactions. Gross outflows associated with tourism, emigrant remittances, and other activities are netted against gross inflows from tourism, bank flows, etc. Some countries have formal customs reports that require reporting of currency taken across borders. In some countries, data for small transactions need not be reported, or are only sampled.

6.31 Data on currency shipments are important for estimating the cross-border currency flows. Wholesale shipments of U.S. currency are provided by a few large

[21] The ECB retains 8 percent of the total euro banknotes issued, and the remaining 92 percent is allocated to member countries based on the pre-determined shares.

[22] Though several countries have shown considerable interest in adjusting their monetary aggregates for circulation of foreign currency, implementation of such adjustment has not followed. Adjustments for cross-border currency flows has been undertaken for the balance of payments statistics for some countries.

financial corporations that specialize in this service. Local financial institutions acquire or repatriate U.S. dollars through wholesale shippers. For large shipments of U.S. currency, the US Customs Department requires that a currency and monetary instrument report (CMIR) be filed by the shipper. The reporting applies only to cross-border currency shipments of US$10, 000 or more.

6.32 Survey methods can be used to estimate foreign currency holdings of the general population of a country. In addition to amounts of U.S. dollars, euros, and other foreign currencies held, the survey questions can delve into motives for foreign currency holding, identification of currency exchanges frequented by respondents, and their propensities for overseas travel. A general aversion to disclosure of personal or confidential information about currency transactions and holdings undermines the reliability of data from direct surveys of households or businesses.[23]

6.33 A technique for eliciting relatively accurate responses is to survey households' only about their foreign currency holdings *relative to* their national currency holdings. Using survey responses on the ratio of foreign currency holdings to national currency holdings and an estimate of households' total national currency holdings, foreign currency holdings of households can be estimated.

6.34 Some insight into currency circulation may be gained by analyzing data on national currency holdings[24] prior to introduction of dollarization or before widespread use of co-circulation. However, care must be exercised in extrapolating from historical experience. Data on currency holdings in the period just prior to dollarization may reflect a flight to currency in response to financial and economic instability in the country (which may have provided impetus for the move to dollarization). For a country experiencing an evolution from cash-based to deposit-based transactions in the retail market, the propensity for currency holding in periods before dollarization or significant co-circulation may contain scant information that is relevant to the present period.

6.35 Estimation of the foreign-currency circulation in the co-circulation context can be based on econometric modeling of the demand for money. In these models, the quantity of money—observed deposits and national currency *plus* the unobserved co-circulation currency—is specified as dependent of a set of macroeconomic variables (a measure of national income, interest rates, expected inflation, etc.) Applying econometric methods, an estimate of the unobserved quantity of the co-circulation currency can be obtained.[25]

Deposits

[23] A significant share of the currency circulation is usually associated with "underground activities," ranging from smuggling to the use of cash transactions to avoid the recording of taxable income. Exclusion of participants in these activities distorts the coverage of the survey; inclusion leads to useless results.

[24] Total amount or as a proportion of a broad or narrow monetary aggregate.

[25] These and other methods of estimating the amount of co-circulating currency are described in Krueger and Ha (1995).

Issued by public nonfinancial corporations

6.36 Public nonfinancial corporations (typically, post office and telecommunication units) in some countries accept deposits from individuals (and possibly small businesses).[26] In this guide, these deposit facilities are characterized by function and are designated as *savings systems* in recognition that savings deposits are the major type of deposits accepted.

6.37 Data collection depends on the institutional characteristics and financial activities of a savings system:

- *Separate institutional unit*. A savings system may have a separate set of accounts within the public nonfinancial corporation.[27] *This guide recommends that the savings system be classified as an ODC and be required to report balance-sheet data in accordance with the standard procedures for monthly reporting by ODCs.*

- *Savings deposit pass-through to a depository corporation*. In some countries, deposit-taking constitute the only financial service provided by the savings system. The savings system maintains a deposit account at a depository corporation (central bank or ODC) into which all funds from the savings deposits are redeposit. The saving system's deposits at the depository corporation are included in broad money, given that the public nonfinancial corporation operating the savings system is within a money holding sector.[28] Inclusion of the savings systems' direct liability to its depositors would result in double-counting, given that the saving system cannot use the depository corporation balances for its own expenditures.

- *Savings-deposit funding for central government*. Funds obtained from deposits in the savings system may be channeled directly to the central government for its use as budgetary or extrabudgetary funds. Data for the deposits need to be collected directly from the nonfinancial corporation that operates the savings system, if the savings deposits are to be included in broad money. A line for these deposits is included in the presentation of the components of broad money (see Box 6.3).

Issued by central government

6.38 The treasury or some other division of the central government may accept deposits or issue securities that are included in the national definition of broad money.

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[26] The deposit-taking is provided for the convenience of small savers, particularly those in rural areas that are not served by ODC branches.

[27] In such cases, the savings systems often engage in financial intermediation by taking deposits from small savers and lending to farmers and other small-loan customers.

[28] Presupposing public nonfinancial corporations' deposits are included in the definition of broad money.

The proceeds from issuance of the deposits or securities may be used for various types of central government expenses, or may be used for government lending directly to other sectors of the economy.[29] Data on the securities outstanding and/or the deposits need to be obtained directly from the treasury or other relevant division of the central government. For the compilation of broad money, the relevant data include only those securities and/or deposits held by money holding sectors.

Issued by financial corporations in liquidation or reorganization

> The other depository corporations subsector may include corporations operating under the control of receivers or regulators or that are no longer dealing with the public. ***MFSM*, ¶95**
>
> This manual recommends exclusion of all deposit liabilities of nonoperating depository corporations from the monetary aggregates, **if the expectation is that depositors will not have access to the funds within the next 12 months. These should be classified as restricted deposits (excluded from broad money), if (1) depositors are expected to recover less than the full value of the deposits or (2) the full recovery of deposit funds is expected to occur after a protracted period.** These deposits should continue to be classified as restricted deposits as long as the nonoperating units continue to exist as legal entities. Reorganization, sale, or merger of the affected depository corporations may result in all or part of the deposits eventually becoming available to depositors. ***MFSM*, ¶308, revised.**
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> [Note: Bolded text has been added for clarification.]

6.39 The *MFSM* unequivocally stated that the liabilities of nonoperating depository corporations should be excluded from the monetary aggregates. This recommendation is qualified in this guide in recognition that insured deposits in these depository corporations may be more liquid than the least liquid liabilities included in the national definition of broad money. *This guide recommends that all transferable deposits of these depository corporations be moved to the category of Other deposits. These deposits may continue to be included in broad money to the extent that the deposits are covered by deposit insurance, when a financial corporation is in liquidation, or if the depositors' accounts are to be transferred to a reorganized depository corporation within a reasonable period (e.g., within 12 months).*[30] Uninsured deposits in an other depository corporation in liquidation are classified as *Other deposits excluded from broad money*.

6.40 In the process of restructuring or liquidation, assets and liabilities of nonoperating depository corporations are frequently re-packaged and auctioned or otherwise transferred to ODCs and emerge as balance-sheet items of the operating depository corporations. Efforts should be made to ensure uninterrupted coverage of these assets and liabilities in the monetary statistics throughout the entire restructuring or liquidation process.

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[29] This lending will be reflected in *Net lending/borrowing* in the statement of government operations.

[30] This recommendation can be applied to informal, or implicit, deposit insurance in a few countries where the central government is known to stand ready to fully reimburse depositors in the absence of deposit insurance or a formal guarantee.

6.41 Nonoperating depository corporations are intertwined in creditor/debtor relationships with ODCs and the central bank. Their reciprocal asset/liability positions are netted out in the consolidation of the *Other Depository Corporations Survey* and the *Depository Corporations Survey*. In the absence of direct reporting by nonoperating financial corporations, data on their reciprocal asset/liability positions (and transactions, if any) with the central bank and operating financial corporations can be obtained from the accounts of the central bank and operating corporations.

6.42 Each operating financial corporation would be required to report its positions with nonoperating financial corporations in a format that would enable the monetary statistics compilers to aggregate the data into memorandum items in the sectoral balance sheets of the central bank, ODCs, and OFCs.[31]

6.43 Reporting of positions may be a responsibility of the management of the closed financial corporation or the receivership (trustee) who is overseeing the liquidation for reorganization. The reporting responsibilities often are delegated to a restructuring agency that is responsible for the liquidation of nonoperating financial corporations in a country in which several financial corporations are being dissolved simultaneously. The restructuring agency may function in a strictly custodial or fiduciary capacity, or may be structured to acquire assets and liabilities of the ODCs under liquidation.

6.44 The monetary statistics compilers should request that the data reporters update the valuation of assets and liabilities to reflect the price and exchange rate changes during the reporting period. Even if no transactions that would affect the levels of assets or liabilities are undertaken during the period, the balance sheet data need to be updated for valuation and currency-conversion changes. Valuation of assets and liabilities of the nonoperating financial corporations should follow the general principles recommended in the *MFSM* and this guide.

6.45 Transactions in financial assets or liabilities of the nonoperating depository corporations should be recorded at the transaction prices. Any difference between the transaction price and the balance-sheet value of the financial asset or liability should be recorded as a valuation change.[32]

6.46 Reserve deposits that nonoperating financial corporations hold in the central bank may be restricted or frozen for a time. Excess reserves of these corporations no longer are used to support credit expansion. The central bank deposits held by the nonoperating financial corporations may continue to be included in Reserve deposit or may be move to

[31] See Chapter 7, ¶34 and the memorandum items in the sectoral balance sheets in illustrative sectoral balance sheets in Appendix 1 of this guide.

[32] For example, if a loan asset with a book value of **100** is auctioned for **75**, a transaction of **75** and a valuation change of **25** (posted as an expense) or **-25** (directly posted to equity) would be recorded.

Other liabilities within *Liabilities to other depository corporations* in the presentation of the *Monetary base* in the *Central Bank Survey*.[33]

Electronic money

6.47 Electronic money is defined as follows:

> *Electronic money* is a payment instrument whereby monetary value is electronically stored on a technical device in the possession of the customer. The amount of stored monetary value is decreased or increased, as appropriate, whenever the owner of the device uses it to make purchase, sale, loading or unloading transactions.[34]

To qualify as electronic money, the payment instrument must represent *generalized purchasing power*—i.e., must be usable for purchases of a goods and services from a wide range of vendors.[35]

6.48 Electronic money includes hardware-based and software-based products. Hardware-based devices (generally a plastic card with an embedded microprocessor chip) primarily are used for face-to-face payments, but can also be used for remote payments by means of a card reader that is linked to an internet connection. *Network money* refers to electronic money transferred through telecommunication channels, by means of either hardware-based or software-based technology.

6.49 The predominant forms of electronic money qualify as deposits rather than currency. The funds stored on the card are used for single third-party payments. The recipients of such payments usually must forward evidence of ownership of the funds to the card issuer for redemption (under *closed circulation of electronic money*). Less common is *open circulation of electronic money*, which takes on the characteristics of an electronic currency. As with banknotes and coins, open circulation allows the funds to be transferred through a sequence of buyer-to-buyer transactions without involvement of the issuer of the electronic money. [36]

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[33] If excluded from the monetary base, the deposits would be classified under the liability category of *Loans* in the *Central Bank Survey*.

[34] European Central Bank (2000a), p. 49. The paper includes the legal definition from the European Parliament and Council Directive 2000/46/EC: ". . ..electronic money shall mean monetary value as represented by a claim on the issuer which is: (i) stored on an electronic device, (ii) issued on receipt of funds of an amount not less in value than the monetary value issued; [and (iii)] accepted as a means of payment by undertakings other than the issuer."

[35] For example, a fare card usable only to purchase rides on public transportation does not qualify, nor does a pre-paid card usable only for purchases from a single merchant (even if the merchant is a department store with a large assortment of merchandise).

[36] Whereas currency has physical features, security for electronic money transactions is provided by electronic cryptography for authentication, confidentiality, and data-processing integrity.

6.50 Nonfinancial corporations sometimes are allowed to issue electronic money, but most issuers are financial corporations. Data collection is straightforward for electronic money issued under closed circulation by ODCs, given that accounting for transactions and balances for the electronic money and for regular transferable deposits are similar.[37]

6.51 *This guide recommends that electronic-money balances originated by ODCs be classified as transferable deposits (disaggregated by economic sector of holder).*[38] *It is also recommended that proliferation of electronic money instruments and issuers be accompanied by consideration of the following actions:*

- *Structural reclassification as ODCs for OFCs that have become issuers of significant amounts of electronic money.*
- *Collection of stock and flow data for electronic money issued by nonfinancial corporations.*[39]

Monetary base

6.52 The presentation of the monetary base in the Central Bank Survey, as shown in Box 6.2, is a comprehensive representation for most countries. In countries where the central bank accepts deposits from money holding sectors, those deposits usually are include in the national definitions of broad money and the monetary base. A separate line for *Deposits excluded from broad money* in the *Central Bank Survey* is applicable in countries in which some or all central bank deposits held by money holding sectors are excluded from broad money and the monetary base.[40]

Box 6.1 The Monetary Base: Representative Components[1] **[*MFSM*, Box 6.2 revised]**
Currency in circulation[2]
Central bank liabilities to other depository corporations
Transferable deposits (required reserves and clearing balances)

[37] In the loading of funds to the electronic-money card, the ODC depositor acquires "hand-held deposits" in exchange for regular deposits (or currency). The ODCs' transactions with the recipients of the electronic funds are similar to electronic settlements for other types of transferable items.

[38] Presumably, the electronic money would be included in the national definition of broad money, as well as in reservable deposit base for the calculation of required reserves.

[39] Depending on the type of payment arrangements and technological infrastructure, the data reporting may be directly to the monetary statistics compilers or may be channeled through ODCs. Conceptually, the payments services could become the major activity of a nonfinancial corporation, thereby qualifying it for reclassification as a financial corporation.

[40] Money-holding-sector deposits in the central bank in one country are *included in* broad money, but are *excluded from* the monetary base. It has been recommended that the definition of the monetary base be reconsidered and, in the absence of revision, that these deposits be included in the line item in *Monetary base* (accompanied by an explanatory footnote in the country page in *IFS*).

Other deposits
Securities issued by the central bank[3]
Central bank <u>deposits</u> included in broad money [Replaces: <u>liabilities</u> . . . .]
Transferable deposits
Other deposits
Central bank securities included in broad money

[1] Broader or narrower definitions of the monetary base may be used in the national context.
[2] Normally comprises currency holdings of all subsectors other than the central bank. In particular, the holdings of the central government, all financial corporations other than the central bank, and nonresidents are usually included along with the holdings of the other sectors. The currency component of the monetary base in the *CBS*, described in Chapter 7, includes only the national currency issued by the central bank.
[3] If holdings of these securities can be used in satisfying reserve requirements, they are included in the monetary base. Otherwise, such holdings are included or excluded, depending on the specific formulation and analytical use of the monetary base.

6.53 Most ODC deposits in the central bank are included in the monetary base. An exception may arise when central banks sell securities to ODCs under repurchase agreement. In the methodology of the macroeconomic statistics, the repurchase agreement is classified as a collateralized loan.[41] For the central bank, the transaction is recorded as a new liability—a loan from the ODC—accompanied by a reduction in ODC deposits within the monetary base. In the Central Bank Survey, the loan from the ODC is included either in the category of *Other liabilities* within *Liabilities to other depository corporations* or in *Loans* (which are excluded from the monetary base), depending on whether the monetary base is defined to include the loans arising from the securities repurchase transactions).[42]

Box 6.2 Monetary Base in the Central Bank Survey
Monetary Base
Currency in circulation
Liabilities to other depository corporations
Reserve deposits
Other liabilities
Deposits included in broad money
Transferable deposits (disaggregated by money holding sector, MHS)
Other deposits (disaggregated by MHS)
Securities other than shares, included in broad money (disaggregated by MHS)

6.54 *Liabilities to other depository corporations* within the *Monetary base* section of the Central Bank Survey includes separate lines for *Reserve deposits* and *Other liabilities*. Both lines are applicable in countries that have separate accounts for (1) required reserves and (2) ODC balances used for settlement purposes. In these countries,

[41] See the *MFSM*, ¶145.

[42] Inclusion or exclusion from the monetary base will depend on the central banks' objective in engaging in the securities repurchase. If the objective were to reduce liquidity in the ODCs, the ODC loan would not qualify as reservable asset (i.e., would not contribute to satisfaction of reserve requirements), and the loan would be excluded from the monetary base. If the objective were to provide an interest-earning alternative to ODCs' non-interest-bearing reserves in the central bank, the loan could qualify as a reserve asset of the ODCs for inclusion in monetary base in the liability section of the *Central Bank Survey*.

an ODC must maintain fixed amount of reserves throughout the required reserve maintenance period. Other countries' reserve requirement systems allow averaging of an ODC reserve holdings over the reserve maintenance period, and reserves held to satisfy reserve requirements are indistinguishable, within the reserve maintenance period, from reserves that ODCs hold for check clearing and/or other payment purposes. Only the line for *Reserve deposits* within the *Monetary base section* is applicable for countries that use reserve averaging in the specification of the reserve requirements. Additional information about required reserves is presented in Annex 6.1.

Reporting of monetary aggregates to the IMF (Form 5SR)

6.55 *Report Form 5SR for the Monetary Aggregates*[43] has three sections: (1) *Broad Money*, (2) *Broad Money Seasonally Adjusted*, and (3) *Monetary Aggregates*. *Broad Money* is disaggregated by financial instrument (currency, deposits, and securities other than shares) and by issuer (depository corporations, central government, and nonfinancial corporations), as shown in Box 6.3.

6.56 The *Broad Money* section in Form 5SR is standardized across countries, but the data in the *Broad Money Seasonally Adjusted* and *Monetary Aggregates* sections are dependent on each country's procedures (if any) for seasonal adjustment and on the national definitions of the monetary aggregates (M1, M2, . . ., *Broad Money*).[44]

Box 6.3. Broad Money in Report Form 5SR for Monetary Aggregates

Broad Money
- Currency in Circulation Outside Depository Corporations
- Currency issued by Central Government
- Deposits in Depository Corporations
- Deposits in Nonfinancial Corporations (including Electronic Money)
- Securities Issued by Depository Corporations
- Securities Issued by Central Goverment[1]

Broad Money Seasonally Adjusted

[1] Conceivably, a treasury or other unit of central government could accept deposits that are included in the national definition of broad money. Such deposits would be included in the line for *Securities Issued by Central Governments*, and the monetary statistics compilers would be informed of the inclusion.

Presentation of monetary aggregates in *International Financial Statistics*

6.57 The new *IFS* presentation of a country's data (referred to as a *country page* in *IFS*) contains a separate *Monetary aggregates* section, which includes (1) *Broad money* and its components, as shown in Box 6.3, (2) lower-ordered monetary aggregates (e.g. M1 and M2, when M3 is designated as broad money), and *Broad money seasonally adjusted* (if estimated and reported by the country).

[43] The prototype for Form 5SR is shown in Appendix 2 of this guide, along with the standardized report forms for central bank (Form 1SR), ODCs (Form 2SR), and OFCs (Form 4SR).

[44] These lines in Form 5SR are the only non-standardized lines in the standardized report forms.

6.58 *Broad money seasonally adjusted* also appears directly beneath the *Depository Corporations Survey* in the country page.[45] The seasonally adjustment for this series is performed by the IMF, which applies a single seasonal adjustment procedure to the unadjusted broad money data for each country. These data are the only *Broad money seasonally adjusted* for those countries that do not produce their own seasonally adjusted data. For all countries, these are the data that have cross-country consistency with respect to seasonal-adjustment methodology.

6.59 Disaggregated data for depository corporation's broad-money liabilities are contained in the *IFS* country-page presentations of the *Central Bank Survey* and the *Other Depository Corporations Survey*.

Divisia money

> Money, which takes the form of various types of financial assets, is held for its usability as a medium of exchange, store of value, or both. In constructing broad-money aggregates, it is necessary to evaluate the degree of *moneyness* of a wide array of financial assets, focusing on the extent to which each type of financial asset provides *liquidity* and a store of value. Liquidity refers to the extent to which financial assets can be sold at, or close to, full market value on short notice. ***MFSM*, ¶287.**

Divisia money is a measure of the money supply that weights the money components—currency, transferable deposits, time deposits, etc.—according to the usefulness of each component for transactions purposes. The description of monetary aggregates in the *MFSM* (Chapter VI) focuses on a measure of broad money (M) in which the money components (x_i, $i = 1, 2,...N$) are weighted linearly and equally in the final total: $M = \sum_{1=1}^{N} x_i$, wherein the components (x's) are treated as perfect substitutes with respect to *moneyness*. A monetary aggregate that is an unweighted sum of components has the advantage of simplicity, but a monetary aggregate with weighted components may be expected to exhibit a stronger link to aggregate spending in an economy.

In a Divisia money formulation, the money components are weighted unequally in accordance with their relative usefulness for making transactions, which is proxied by the *user costs* (opportunity costs) of holding the various money components. A *user cost* is measured by the spread between a benchmark rate—the interest rate paid on a financial asset that has no usefulness for making transactions in the short run—and the interest rate paid on a particular component of the monetary aggregate. The *user cost of the ith money component* is given by $User\cos t_i = r_{B,t} - r_{i,t}$, where $r_{B,t}$ and $r_{i,t}$ are the benchmark rate (after-tax) and the interest rate (after-tax) for the ith money component at time t.

By weighting the monetary components, a Divisia money formulation takes account of the trade-off between the medium-of-exchange and store-of-value functions of the holding of the money components. It is assumed (1) that relatively illiquid deposits are less likely to be used for transactions purposes than highly liquid financial assets in the

[45] The *Depository Corporation Survey* is shown in Table 7.11 in Annex 7.3 (Chapter 7).

money supply and (2) that higher interest rates are paid on the less liquid money components. The largest weights tend to be attached to components that are directly usable as media of exchange (national currency and non-interest-bearing transferable deposits), but which are least useful as stores of value.[46] The smallest weights tend to be assigned to the relatively illiquid components for which the interest rates are closest to the benchmark rate.

Divisia money formulations originated in the U.S.,[47] but have become most prominent at the Bank of England (BOE) which has published Divisia money series since 1993. The BOE publishes a Divisia money series for a broad money aggregate, as well as Divisia series for the money holdings of separate money-holding sectors—i.e., for the household sector, private nonfinancial corporations sector, and other financial corporations sector.[48] The BOE equation for Divisia money is shown in Box 6.4.

[46] Box 6.4 shows that the weights depend on the user costs of the components, but also on the relative amounts outstanding of the various money components. For example, if the outstanding amount of currency is small relative to those of other money components, currency may still be allocated a smaller weight than some illiquid components.

[47] The Divisia index was originated by the French economist Francois Divisia (1925). Divisia money formulations utilize discrete-time approximations of the continuous-time Divisia index. On the development of the Divisia index for monetary aggregates, see Barnett (1980); Barnett *et al* (1984); and, Barnett *et al* (1992).

[48] On the BOE formulation of Divisia money, see P. Fisher *et al* (1993); and Janssen (1996). On recent revisions in the BOE formulation, see Hancock (2005a) and Handcock (2005b).

Box 6.4. Divisia Money (The Bank of England's Definition)

Divisia (D) growth rates are calculated as a weighted averages of the growth rates of the *N* components of a monetary aggregate, using the following equation:

$$\frac{D_t - D_{t-1}}{D_{t-1}} = \sum_{i=1}^{N} \frac{1}{2}(W_{i,t} + W_{i,t-1}) \frac{\Delta M_{i,t}}{M_{i,t-1}},$$

where $M_{i,t}$ denotes the outstanding amount of the *i*th component of the monetary aggregate, $\Delta M_{i,t}$ is the corresponding change, and $W_{i,t}$ is the weight for the *i*th component, defined as:

$$W_{i,t} = \frac{M_{i,t}(r_{B,t} - r_{i,t})}{\sum_{i=1}^{N} M_{i,t}(r_{B,t} - r_{i,t})},$$

where $r_{B\,t}$ is the effective interest rate on the benchmark asset, and r_{it} is the effective rate on the *i*th asset.

Credit and debt

Measures of **debt** have the same three dimensions as monetary aggregates. Defining **debt** measures involves specifying (1) the **liabilities** included, (2) the issuing sectors (**borrowers**), and (3) the holding sector (**lenders**).

[Bolded text indicates revisions in ***MFSM*, ¶334, first sentence.** The revised sentence should be moved to **¶348, first sentence**.]

Credit measures may cover all or only a subset of financial assets that constitute forms of credit. Narrow credit measures cover claims in the form of loans, securities other than shares, and trade credit and advances. Such measures exclude deposits, shares and other equity, financial derivatives, claims on life insurance corporations and pension funds in the form of insurance technical reserves, and other accounts receivable that are not part of trade credit. ***MFSM*, ¶337**.

The *DCS* presented in Chapter 7 provides the statistical framework for developing credit measures for depository corporations' claims. Broader measures may cover all financial corporations' claims, as included in the *FCS* described in Chapter 7. ***MFSM*, ¶340**.

The Inter-Agency Task Force on Finance Statistics[†]**. . . has published** the *External Debt Statistics: Guide for Compilers and Users* **(2003)**, **which provides** international methodological standards for the measurement of external debt, as well as guidance on the analytical use of the data and on the sources and methods for their compilation. The guide **updates** *External Debt: Definition, Statistical Coverage, and Methodology*, 1988. ***MFSM*, ¶361, <u>updated</u>.**

[†] Prepared under the joint responsibility of the Bank for International Settlements, Commonwealth Secretariat, Eurostat, International Monetary Fund, Organization for Economic Co-operation and Development, Paris Club Secretariat, United Nations Conference on Trade and Development, and World Bank;

Seasonal adjustment of economic time series

General principles

6.60 Seasonal adjustment of economic time series involves the estimation and removal of influences that recur each year as a result of public holidays,[49] harvest seasons or other production cycles, model-year changeovers, administrative and legal measures, etc. Seasonal adjustment can be based on mathematical (deterministic) models, econometric (stochastic, or statistical) models, or both. Procedures that combine mathematical and econometric techniques are now widely used.

6.61 Many countries apply seasonal adjustment procedures to price statistics, GDP and other national accounts statistics, exports/imports and other balance of payments statistics, monetary and financial statistics, and other macroeconomic time series. Seasonal adjustment is applied to both monthly and quarterly data.[50]

6.62 Seasonal adjustment of monetary aggregates and, to lesser extent, credit aggregates are the most common applications of seasonal adjustment of monetary and financial statistics. This section describes the general application of seasonal adjustment methods with emphasis on seasonal adjustment of monetary aggregates.[51] Quarterly data for the monetary aggregates may be seasonally adjusted, but seasonally adjusted monthly data are viewed a the most relevant for analytical[52] and policy purposes in most countries. This section focuses on seasonal adjustment of monthly data for a monetary aggregate such as broad money, but the general principles apply to seasonal adjustment of quarterly monetary series and monthly and quarterly series for other economic variables.

Direct and indirect methods of seasonal adjustment

6.63 Economic time series—monetary aggregates, GDP, and many others.—consist of additive component series. Availability of separate time series for an aggregate and its components gives rise to three options for the seasonal adjustment:

- *Direct approach*. Seasonal adjustment of the aggregate time series to produce a seasonally adjusted series.

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[49] Holidays such Christmas or New Year occur on a fixed day and month of each year, whereas the dates of holidays such as Chinese New Year, Easter, Ramadan, and Deepavali move from year to year. Seasonal adjustment methods can accommodate both fixed and moving holiday season.

[50] Seasonal adjustment has also been applied to weekly and daily data, but with limited success.

[51] This section draws on documentation of the European Central Bank's methodology for seasonal adjustment of monetary aggregates and price statistics, as contained in European Central Bank (2000b). Also see Manna and Peronaci, eds. (2003). On seasonal adjustment of national accounts statistics, see Bloom et al (2001), Chapter VIII.

[52] Econometric model builders exercise a choice, testing their models using either seasonally adjusted data or unadjusted data. Using unadjusted data, seasonality in the data is reflected in the estimated coefficients and error terms of the models.

- *Indirect approach*. Seasonal adjustment of the individual components of the aggregate series to produce seasonally adjusted components that are summed to obtain the seasonally adjusted aggregate series.

- *Multivariate approach*. Simultaneous seasonal adjustment of the components of the aggregate or, in some cases, simultaneous seasonal adjustment of the components of the aggregate *and* other economic time series that are linked to the aggregate series through a balance-sheet relationship.

6.64 Direct seasonal adjustment is preferable from a cost standpoint, because the seasonal adjustment is performed on only the aggregate time series. However, indirect seasonal adjustment may be warranted, if the additional costs of seasonally adjusting a set of times series can be justified. Compilers are encouraged to experiment with both approaches. Because of cost considerations, the choice may be between (1) a thoroughly analytical application of the direct approach and (2) a relatively cursory application of the indirect approach, using the default options of a user-friendly software package for seasonal adjustment (described later in this section). *This guide recommends that, if a choice between approaches is necessary, the analyst responsible for the seasonal adjustment of broad money should concentrate on a thorough application of the direct approach, utilizing as many of the diagnostic tools and other advanced features of the seasonal adjustment software as possible.*

6.65 Application of the indirect approach can take various forms, depending on the way in which the components of the aggregate are defined. The components of broad money can be specified as currency outside depository corporations, transferable deposits, other deposits, and securities other than shares. Alternatively, the broad-money components can be less disaggregative, for example; A = M1 (i.e., currency plus transferable deposits); B = M2 *less* M1; and C = Broad Money *less* M2. Components A, B, and C each would be seasonally adjusted, and the seasonally adjusted components would be summed to obtain the seasonally-adjusted series for broad money.[53]

An unambiguous decision rule for choosing between the direct and indirect methods of seasonal adjustment does not exist. The choice must be made on a case-by-case basis, after experimentation with both methods. Similarly, empirical analysis is required in deciding on the component series to be used, if the indirect method is chosen. For a specific time series, several practical criteria have been recommended. These include (1) "smoothness" of the seasonally adjusted series,[54] (2) minimization of revision errors, (3) stability of seasonal components, and (4) out-of-sample forecasting accuracy. Informal "rules of thumb" are: (1) the direct approach has advantages when the components of the

[53] Another alternative would be to disaggregate the deposit and securities components of the broad money series, by economic sector of holder—public non-financial corporations, other nonfinancial corporations, other resident sectors, etc. *Such disaggregation is likely to be impractical and in general is not recommended for an indirect approach to seasonal adjustment of monetary aggregates.*

[54] The smoothness criterion is specified in terms of "roughness measures" computed for seasonally adjusted series obtained by each approach. The criterion does not imply that seasonal adjustment is aimed at smoothing a time series, but seasonal adjustment generally leads to a time series with less variability.

aggregate time series are highly correlated; (2) the indirect approach has advantages with respect to minimization of estimation and revision errors when the components have dissimilar stochastic (statistical) properties; and (3) the indirect approach has advantages when the contribution of each component, as a proportion of the aggregate, fluctuates significantly over the estimation period.[55]

6.66 Application of the multivariate approach to seasonal adjustment, though conceptually appealing, has major practical limitations. For the monetary statistics, a major application would involve the simultaneous seasonal adjustment of categories for all assets (loans, securities other than shares, etc.), all broad-money components, and all other liabilities (deposits excluded from broad money, loans, etc.) in the Depository Corporations Survey, while preserving the balance-sheet identity in the seasonal adjustment process.

6.67 The multivariate approach is not advocated in this guide, because of its computational complexity and software limitations. The most widely used software packages for seasonal adjustment, described later in this section, are designed exclusively for univariate (single-series) seasonal adjustment. Major advantages of these seasonal adjustment programs include ease of use, diversity of modeling specifications, and breadth of advanced statistical tools for specification of the seasonal-adjustment model, estimation of the seasonal components, and diagnostic testing of the time-series output.

Seasonal-adjustment software packages

6.68 The most popular seasonal adjustment packages, extensively applied worldwide, are (1) the X-12-ARIMA program of the U.S. Census Bureau and (2) the combination of the TRAMO ("Time series Regression with ARIMA Noise, Missing Observations and Outliers") and SEATS ("Signal Extraction in ARIMA Time Series") programs, developed at the Bank of Spain.[56] The X-12-ARIMA and TRAMO/SEATS programs have statistical properties that are worthy of combining, which has prompted the development of an X-12-ARIMA-SEATS approach.

6.69 The ARIMA module (called RegARIMA) in X-12-ARIMA and the TRAMO part of TRAMO/SEATS are similar in that both use time-series regression models to forecast (and backcast) input data and to detection and correct for outliers, calendar-effects, missing observations, etc. The decomposition modules in X-12-ARIMA and SEATS are used to separately identify and estimate the trend-cycle, seasonal, and irregular components of a time series, but using different methods. The X-12-ARIMA method uses an existing set of moving-average filters, whereas the SEATS method uses ARIMA-based signal extraction with filters derived from the ARIMA-type modeling.

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[55] For more information, see European Central Bank (2000b), pp. 9-10. Also, see Burnett (2006); and Thorp (2003), 4-8.

[56] V. Gòmez and A. Maravall, "Programs TRAMO and SEATS, Instructions for the User (with Some Updates)," Working Paper 9628, Research Department, Bank of Spain, 1996.

6.70 The X-12-ARIMA program—still the most widely applied worldwide—is used by the IMF to seasonal adjust the monthly data for *Money* in the *IFS* country pages. Until recently, the seasonally adjusted money series in the *IFS* country pages were obtained by applying the *X-11 Seasonal Adjustment Program.* In 2002, the IMF began transitioning to use of X-12-ARIMA.[57] Application of X-12-ARIMA requires a time series that has a sufficient number of observations. As of end-2005, the requirements have been satisfied for nearly all countries, and the *Money, Seasonally Adjusted* in most *IFS* country page have been based on X-12-ARIMA techniques. *Money, Seasonally Adjusted* refers to the money supply as narrowly defined. *Broad Money, Seasonally Adjusted* will appear in the revised presentation in the *IFS* country pages.[58]

6.71 The X-11 program[59] was based on a mathematical model that utilized ratio-to-moving-average specifications pioneered by Frederick B. Macaulay at the National Bureau of Economic Research in the 1920s. The *X-11* designation was used to indicate that the original X-1 program underwent ten revisions and reached version X-11 by the late 1960s. Research at Statistics Canada in the early 1970s led to the seminal version of an X-11-ARIMA model,[60] which combined the mathematical procedures in X-11 with econometric techniques popularized in the 1969 edition of Box-Jenkins (1976).[61] Refinements have led to the current version of X-12-ARIMA, as published by the U.S. Bureau of the Census.

6.72 The modular structure of the X12-ARIMA program is shown in Box 6.6. The regARIMA model is used to prepare the data input to the X11 module in which the decomposition of the time series into trend/cycle, seasonal, and irregular components is performed. An important function of the regARIMA modeling is to extend the time series with pre-series estimates (backcasts) and post-series forecasts to improve the estimates of the seasonal adjustments to the earliest and most recent data, mitigating problems that would arise if asymmetric seasonal moving-average processes were used in the X11 decomposition of the time series.

6.73 A third stage of the seasonal adjustment process is statistical analysis of the data output of the X11 module, including the seasonally adjusted time series. The analysis utilizes standard statistical tests and examination of out-of-sample forecasts of the

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[57] Bureau of the Census (1999).

[58] The IMF employs the automatic options in the X12-ARIMA program, because of the magnitude of the task and the need to present data for which the seasonal adjustment is consistent across countries. Detailed examination of seasonality in the money series for about 180 individual countries on an ongoing basis is not feasible. Compilers are encouraged to undertake more detailed investigations in the national context, and more refined results can be reported to the IMF in Form 5SR, as well as being disseminated directly.

[59] Julius Shiskin *et al* (1967). Revision stalled at version X-11, when Julius Shiskin was reassigned within the Bureau of the Census.

[60] E.B. Dagum (1998).

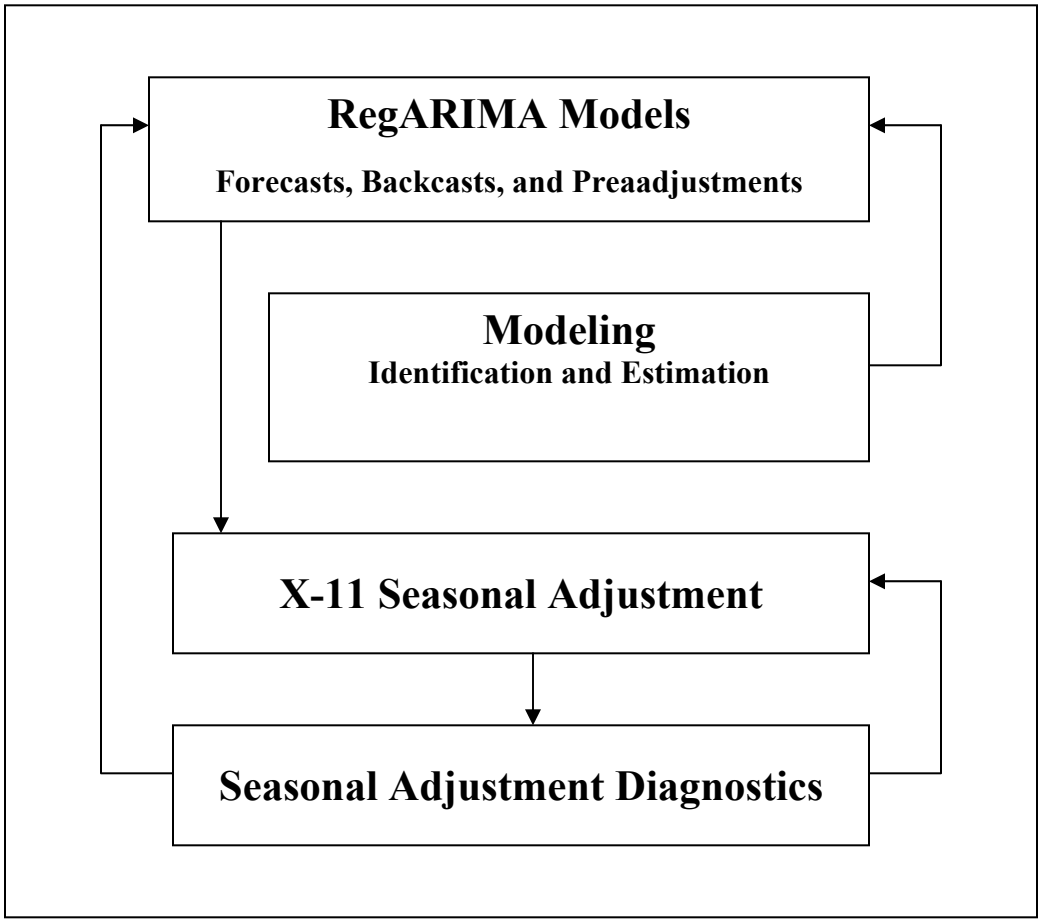
[61] Box and Jenkins (1976). The third edition is Box, Jenkins, and Reinsel (1994).

seasonally adjusted data. The seasonal adjustment procedure may need to be an iterative process in which the RegARIMA and X-11 decomposition are repeated until the post-X11 analysis indicates that the seasonally adjustment is satisfactory.[62]

6.74 In a broad context, the post-estimation analysis subsumes the policies and procedures for revision of the seasonally adjusted data. Standard practice is to re-estimate the seasonal factors when additional time series observations become available. Re-estimation and revision of the seasonally adjusted data can be performed on an annual basis or more or less frequently. The data revision policy—an important component of the seasonal-adjustment framework—may call for several revisions of the seasonally adjusted time series, leading up to the seasonally adjusted series in final form.

[62] Residual seasonality sometimes is found in the adjusted data, leading to further empirical work.

Box 6.6. Structure of the X12-ARIMA Estimation



Custom application of X-12-ARIMA

6.75 For customized time-series models, X-12-ARIMA has capabilities for the three modeling stages: *identification*, *estimation*, and *diagnostic checking*. Use of the regARIMA module requires specification of (1) the regression variables in the mode1 and (2) the ARIMA model for the regression errors. Specification of the regression variables depends on user knowledge about events that influenced the time series.[63]

6.76 *Identification* of the ARIMA model for the regression errors is based on well-established procedures in the Box-Jenkins (1976) analysis, which require examination of sample autocorrelation and partial autocorrelation functions generated by the X12-ARIMA program.[64] The general multiplicative seasonal ARIMA model is shown in Box 6.7.

Box 6.7. ARIMA Models

ARIMA is the acronym for *Autoregressive Integrated Moving Average* models of time series with well-behaved statistical properties. The ARIMA model that is usually relevant for seasonal adjustment purposes is a multiplicative model that has autoregressive and moving-average terms (called a mixed autoregressive-moving average model) specified with regular (period-to-period) and seasonal periodicity. The multiplicative characterization arises from the interaction of the period-to-period terms and seasonal terms in the model.

The *general multiplicative seasonal model* of order (p, d, q) × (P, D, Q) is:

$$\varphi_p(B)\Phi_P(B^s)\Delta^d\Delta_s^D z_t = \theta_q(B)\Theta_Q(B^s)a_t,$$

where z_t denotes the original time series; $\varphi_p, \Phi_P, \theta_q, and\ \Theta_P$ are finite polynomials in B, which is the backshift operator such that $Bz_t = z_{t-1}$, $B^2z_t = z_{t-2}$, etc.; $\Delta^d\ and\ \Delta^D$ are regular and seasonal difference operators (e.g., $\Delta z_t = z_t - z_{t-1}$ and $\Delta^s z_t = z_t - z_{t-s}$); s is the periodicity of the z_t (e.g., s = 12, for monthly data); and a_t is a white-noise variable (zero mean and constant variance, V_a).

An ARIMA model that does not have seasonal parameters (i.e., P = D = Q = 0) is specified as:

$$\varphi_p(B)\Delta^d z_t = \theta_q(B)a_t.$$

A well-behaved time series exhibits stationarity, and the error terms of the stochastic process that generates the time series have the appropriate statistical properties (i.e., zero mean and constant variance). *Integrated* in *Autoregressive Integrated Moving Average* refers to removal of regular and seasonal trends in a non-stationary time series to obtain a stationary series. Integration most commonly is performed by differencing the non-stationary series (period-to-period and/or at seasonal intervals) to obtain a stationary series.

[63] The regression variables usually are those specified from intervention modeling in which an exogenous effect on a time series can be specified as a short-lived spike in the data or as an effect that gradually increases or decreases (called a *ramp*) within a particular range of the time series. On intervention analysis, see Box and Tiao (1975). Also see Hillmer and Tiao (1982).

[64] *Spectral analysis* is also a useful tool for model identification. The *power spectrum* is the Fourier cosine transform of the autocovariance function. Spectral plots may reveal spikes at seasonal frequencies. For many applications, however, plots of the autocorrelation and partial autocorrelation functions are sufficient for identifying the ARIMA models. On spectral density functions, see Box and Jenkins (1976), 39-45.

6.77 *Parsimony* is a fundamental principle of the identification procedures. A model specification might include many parameters, when a simpler specification with fewer parameters would have been adequate. Such "over-specification" can lead to unnecessarily poor estimation of the time series. For example, specification of a moving-average process with a single parameter may substitute for an autoregressive process that has many parameters, or vice versa.[65]

6.78 *Estimation* of the parameters of the regARIMA model is performed by the X-12-ARIMA routine for maximum likelihood estimation using an iterative generalized least squares algorithm.

6.79 *Diagnostic checking* involves analysis of the residuals from the fitted model to explore the possibility of model inadequacies. X-12-ARIMA produces several standard residual diagnostics for detecting additive outliers and level shifts in the data. The program also produces forecasts, forecast standard errors, and prediction intervals from the fitted regARIMA model.

Decomposition of an economic time series

6.80 For seasonal adjustment purposes, a time series is decomposed into three major components:

- *Trend-cycle component* (T_t). Constitutes the underlying path or general direction reflected in the data, combining the long-term trend and business-cycle movements.

- *Seasonal component* (S_t^c). Comprises *seasonal effects narrowly defined* (S_t) and calendar-related systemic effects that are not stable in timing from year to year, including *trading-day effects* (TD_t), *moving events effects* (ME_t), and *other calendar effects* (OC_t). *Trading day effect*s arise from year-to-year variations in the number of work days (trading days) and the weekday composition for a particular month or quarter relative to the standard for a particular month or quarter.[66] *Moving events effects* arise from occasions such as moving holidays, paydays for large groups of employees, and pension payments that occur at regular intervals but not at exactly the same time each year. The *other calendar effects* include leap-year and length-of-quarter effects. All seasonal sub-components represent systematic, persistent, predictable, and identifiable effects.

- *Irregular component* (I_t^c). Comprises the effects that are unpredictable in the absence of additional information about the timing, impact, and duration of the occurrence. These effects are *irregular effects narrowly defined* (I_t), *outlier*

[65] On parsimony, see Box-Jenkins (1976), 17-18, 302, 340.

[66] The period-to-period variation of the standard, or average, number and type of trading days for each month or quarter is included in the seasonal effect narrowly defined.

effects (OUT_t), and *other irregular effects* (OI_t).[67] The *irregular effects narrowly defined* is assumed to be a stochastic variable with a mean of 1 for a multiplicative model.

6.81 Seasonal adjustment models can be specified in additive or multiplicative form. The default option in the X-12-ARIMA program is the multiplicative form, because that specification has proved to be superior for a wide variety of economic time series. In the multiplicative specification, the absolute size of the components of the series are dependent on each other, resulting in seasonal variations that increase and decrease with the level of the series. The seasonal and irregular components of the multiplicative model are ratios centered around a value of 1. The multiplicative specification in the decomposition module (still called the *X11* method) in the X-12-ARIMA program is shown in Box 6.8.

[67] *Other irregular effects* can arise from unseasonable weather, natural disasters, labor strikes, etc. However, such effects are mitigated, if they have been taken into account in the regular regression component of RegARIMA in producing the input data for the decomposition in the X11 module.

Box 6.8. Three-Component Seasonal Adjustment Model in Multiplicative Form

The Model[1]

$X_t = T_t \cdot S_t^c \cdot I_t^c$

$= T_t \cdot (S_t \cdot TD_t \cdot ME_t \cdot OC_t) \cdot (I_t \cdot OUT_t \cdot OI_t)$,

where

$S_t^c = (S_t \cdot TD_t \cdot ME_t \cdot OC_t)$ is the seasonal component, and

$I_t^c = (I_t \cdot OUT_t \cdot OI_t)$ is the irregular component.

TD_t, ME_t, and OC_t are the *trading-day effects*, *moving events effects*, and *other calendar effects, respectively.*

The *seasonally adjusted series* is

$A = T_t \cdot I_t^c = T_t \cdot (I_t \cdot OUT_t \cdot OI_t)$

Basic 8-Step estimation:

- *Step 1: Initial estimate of the trend*. A symmetric 13-term moving average is applied to the original monthly time series to obtain an initial estimate of the trend. The trend is removed from the original data to obtain estimates of the seasonal and irregular components.
- *Step 2: Preliminary estimate of the seasonal component*. The estimate is obtained by applying a weighted 5-term moving average to each monthly observation obtained in *Step 1*. The seasonal components are adjusted to add to 12 over each 12-month period. Thereby, the average of these components is one and does not affect the level (trend) of the series.
- *Step 3: Preliminary estimate of adjusted data*. An approximation of the seasonally adjusted series is obtained by dividing each observation from the original time series by the seasonal component estimated in *Step 2*
- *Step 4: Improved estimate of trend*. An additional moving average may be applied to the preliminary data from *Step 3* to produce an improved estimate of the trend. The observations from the original time series are divided by the corresponding values from the improved trend series to obtain revised estimates of the seasonal and irregular components.
- *Step 5: Final estimate of seasonal components*. Step 2 is repeated to obtain seasonal components.
- *Step 6: Final estimate of adjusted data*. Each observation in the original time series is divided by the corresponding final estimate of the seasonal component, thereby obtaining the seasonally adjusted data in final form.
- *Step 7: Final estimate of trend*. An additional moving average is applied to the seasonally adjusted series obtained in *Step 6*, thereby deriving the final estimates of trend.
- *Step 8: Final estimate of irregular component*. The series is obtained by dividing the estimate from *Step 6* by the corresponding trend estimate from *Step 7*.

[1] In the multiplicative class of models, some sub-components may be expressed as additive to the irregular effect narrowly defined—e.g. , as: $X_t = = T_t \cdot S_t \cdot (I_t + OUT_t + OI_t + TD_t + ME_t + OC_t)$.

6.82 The X-12-ARIMA program subsumes all the seasonal adjustment capabilities of the X-11 program. Though the X-11 options for calendar and holiday adjustments are still available, several new options have been added. These include new diagnostic procedures, a facility for producing the revisions history of a given seasonal adjustment, new options for specifying the moving averages of trend filters, new options for seasonal

filters and outlier detection in the irregular component, a table of trading-day factors by type of day, and a new model specification in pseudo-additive form.[68]

Seasonal adjustment revision policy

6.83 Seasonal adjustment analysis is not completed when the first set of data for the seasonally adjusted time series has been produced. Seasonally adjusted data for a time series can be improved by using the additional observations for the time series, as the data become available. Seasonally adjusted data for monetary aggregates and other economic series may be revised several times before the latest revised data are deemed to be final. A general rule is that the seasonal adjustment is repeated until the revisions in the seasonal factors from successive re-estimations are small. Ideally, the concept of *small revisions* can be quantified and, where possible, revision statistics can be applied.[69] Determination of the periodicity of the revisions in seasonally adjusted series is left to the national authorities. *It is recommended that the data revision policy be formalized and the schedule for revised data release be publicized.*

[68] The pseudo-additive model is tailored to series for which the value is zero in some period. Though unlikely to be applied to seasonal adjustment of monetary aggregates, the model may be useful for adjustment of time series for which source data is limited.

[69] Various types of revision analysis have been suggested, including measures of total absolute revision, median absolute revision, mean absolute revision, root mean square revision, mean convergence, and smoothness of convergence. These statistics are described and other information on revision policy is presented in Maurin (2003).

Annex 6.1. Reserve requirements

Reserve requirements with averaging of reserve holdings

6.84 The following terminology applies:

- *Reservable liabilities*. The categories of deposits and, if applicable, securities that are subject to reserve requirements.
- *Reserve computation period*. The period over which reservable liabilities are averaged to determine the reservable liability amounts to which the reserve requirements (in percent) are applied. Alternatively, the computations may be based on reservable liabilities as of a single date—e.g., end-of-month levels.
- *Reserve maintenance period*. The period over which the specified average amount of required reserves are to be held. In some countries, large ODCs have reserve maintenance and computation periods that are different than those for small ODCs.
- *Required reserves*. ODC deposit holdings in the central bank[70] that are used to satisfy reserve requirements. ODC holdings of national coins and currency—vault cash—also qualify as required reserves in some countries. Required reserves are average holdings during a reserve maintenance period.[71] The reserve holdings may be interest-bearing or non-interest-bearing.
- *Lagged reserve requirements*. Required reserve holdings in the reserve maintenance period are based on the average levels of reservable liabilities in a reserve computation period that precedes the maintenance period.[72] The reserve computation period may immediately precede the maintenance period, or may precede the maintenance period by one or more weeks or months.
- *Reserve settlement*. The accounting for required reserves at the end of the reserve maintenance period. Excess reserves arise when the reserve holdings exceed the average amount required for the maintenance period. A reserve deficiency arises when the maintenance-period-average holding is less than the required average amount. A reserve deficiency results in (1) a penalty being applied, (2) an ODC borrowing of reserves from the central bank, or (3) augmentation of the amount

[70] An exception in some countries is permitting some ODCs to hold all required reserves though an ODC that acts as an intermediary in centralizing the reserve holdings.

[71] In some countries, the required amount may be reduced by a lump-sum adjustment. Each ODC is permitted to reduce its required reserve by the lump-sum amount. For a small ODC, the lump sum adjustment may exceed the total amount of required reserves that it would otherwise by required to maintain.

[72] In principle, the reserve-computation period and the reserve-maintenance period can be specified to overlap, resulting in contemporaneous or quasi-contemporaneous reserve requirements such as those applied in the US during the 1984-1998 and pre-1969 periods.

of reserves required for the next reserve maintenance period (if the regulations include a reserve deficiency carry-over provision).

- *Reserve requirements*. The average amounts of average liabilities during the reserve computation period are multiplied by the required reserve ratios, normally stated as percentages of reservable liabilities. Many countries had differential reserve requirements—required reserve ratios that differ across categories of ODC liabilities. Deposit and securities in broad money may be subject to different reserve requirement. Different reserve ratios may also be applied (1) to transferable deposits and other deposits, (2) to short- and long-term other deposits, and (3) to household and corporate deposits. A deposit or security category may have a zero required reserve ratio (i.e., may be excluded from reserve requirements). Some ODCs may be exempt from reserve requirements.[73] Reserve requirements normally apply only to broad money components.[74]

6.85 *All ODC deposits to be used in satisfying reserve requirements (as well as for settlement purposes) are classified as transferable deposits in the sectoral balance sheets of the central bank and ODCs.*

Reserve requirements without averaging of reserve holdings

The following terminology applies:

- *Reservable liabilities*. The categories of deposits and, if applicable, securities that are subject to reserve requirements.
- *Reserve computation date.* Reservable liabilities usually are measured as of a particular date (e.g., at end-month).
- *Reserve maintenance period*. The period over which a specified level (rather than average amount) of required reserves must be maintained.
- *Required reserves*. ODC deposit holdings in the central bank[75] (and possibly ODC vault cash) used to satisfy reserve requirements. The reserve holdings may be interest-bearing or non-interest-bearing.
- *Lagged reserve requirements*. Required reserve holdings in the reserve maintenance period are based on the amount of reservable liabilities as of the reserve computation date that preceded the maintenance period.
- *Reserve settlement*. The accounting for required reserves is on a daily basis. The fixed amount of required reserves applies for each day of the reserve maintenance period. Excess reserves are synonymous with ODCs' other deposits in the central bank—those used for check clearing and other settlement purposes and classified separately from required reserves.

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[73] An exemption sometimes applies to ODCs that are being liquidated or reorganized.

[74] Exceptions are not precluded. For example, the European Central Bank is authorized to impose reserve requirements against liabilities arising from off-balance-sheet items. Such reserve requirements are not currently applied.

[75] An exception in some countries is permitting some ODCs to hold all required reserves though an ODC that acts as an intermediary in centralizing the reserve holdings.

- *Reserve requirements*. The levels of reservable liabilities, as of the reserve computation data period, are multiplied by the required reserve ratios.

6.86 *ODC deposits that are pre-specified fixed amounts of required reserves are classified as other deposits (i.e., non-transferable deposits) in the sectoral balance sheets of the central bank and ODCs. ODC deposits held in the central bank for settlement purposes are classified as transferable deposits in the sectoral balance sheets of the central bank and ODCs.*