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**DATA QUALITY ISSUES REGARDING THE PRODUCTION AND RELEASE OF REVALUATION  
ACCOUNTS AND OF OTHER CHANGES IN VOLUME ACCOUNTS IN LONG TERM SECURITIES**

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*This document has been prepared by J. Guérin and D. Marionnet - Banque de France and will be presented under item 3 of the draft agenda*

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**DATA QUALITY ISSUES REGARDING THE PRODUCTION AND RELEASE OF  
REVALUATION ACCOUNTS AND OF OTHER CHANGES IN VOLUME ACCOUNTS IN LONG  
TERM SECURITIES**

**1. SNA93 and ESA95 prescriptions regarding revaluation, other changes in the volume of assets and the basic accounting identity**

**1.1 *General principles on financial transactions in securities :***

- Financial transactions are recorded at the transaction value, that is the value in national currency at which the assets/liabilities are created, liquidated, exchanged or assumed (SNA93 11.44, ESA95 5.134).
  - Bond and bill issues are recorded at the issue value (SNA93 11.44, ESA95 5.138.b). New shares are recorded at issue value which normally corresponds to nominal value plus the issue premium. (ESA95 5.140.a).
  - Purchases and sales of securities in circulation on the secondary market are recorded at the stock exchange quotation or the market price (ESA95 5.138.f).
  - Bonds and bills which have reached maturity are recorded at redemption value (ESA95 5.138.g).
- In balance sheets, financial assets and liabilities should be valued at current (market) price. They should be assigned the same value whether they appear as financial assets or liabilities. (ESA95 7.44).
  - For securities other than shares, the latter includes accrued interests, if they have been treated in the financial accounts as being reinvested in the corresponding security (ESA95 7.47).
  - Quoted shares : shares and other equities should be valued in the balance sheets at their current prices when they are regularly traded on stock exchanges or other organized financial markets. (SNA93 13.73.)
  - Unquoted shares : the value of unquoted shares should be estimated using the prices of quoted shares that are comparable in earnings and dividend history and prospects, adjusting downward, if necessary, to allow for the inferior marketability or liquidity of unquoted shares. (SNA93 13.73)
  - Mutual fund shares are to be valued at their current stock exchange price, if they are quoted, or at their current redemption value, if they are redeemable by the fund itself (ESA95 7.57).
- Other changes in volume of assets account for shares
  - The admission and delisting of shares are typical other changes in volume of assets.
  - The writing-off of shares due to bankruptcy is recorded in « other changes in volume » accounts. (ESA95 6.27.d, SNA93 12.51)
  - In case of absorption of a company by another one, the disappearance of asset/liabilities between the two previous companies is an “other volume change”. The treatment of splits is symmetrical. (SNA93 12.58&59).

- Changes in the classification of mutual fund shares are treated as “other changes in volumes”

## **1.2 The basic accounting identity and the necessity to differentiate flows from revaluation in the variation of stocks**

- For stocks (S), flows (F), revaluation (V), and “other change in volume” (K), the basic accounting identity linking the opening (accounting period T-1) and the closing balance sheet value (accounting period T) is the following (SNA 93 10.15.):

$$S_T = S_{T-1} + F_T + V_T + K_T$$

- From this accounting identity, different formulas can be derived, depending on the data which are made available by the source, in order to identify the three “candidates” for the variation in stocks: pure transaction or flow, revaluation, and, possibly, change in volume. In many cases, either the flow component or the revaluation component has to be derived from the available source data in a way that they are well differentiated from one another :

$$F_T = (S_T - S_{T-1}) - V_T - K_T \quad \text{or} \quad V_T = (S_T - S_{T-1}) - F_T - K_T$$

- More precisely, the right formula to derive flows varies according to the status of available stocks, i.e. whether stocks are at market value or at acquisition/nominal value :

- For stocks at market value (SMV) :

$$F_T = (SMV_T - SMV_{T-1}) - V_T - K_T$$

- For stocks at acquisition value (SAV):

$$F_T = (SAV_T - SAV_{T-1}) - K_T$$

⇔ In the case of stocks at acquisition value, there is no revaluation component to be deducted from the variation of stocks to obtain the flow.

## **2. The current methodology for quoted securities**

### **2.1. The available sources on the liability side (sources by instrument)**

- Bonds:

- The bond database provides stocks and flows by resident issuing sector at market value

- Quoted shares:

- The Stock exchange provides stocks and flows at market value, as well as other changes in volume (admitted and delisted shares)

- Mutual funds shares:

The mutual fund database provides stocks at market value by type of funds (monetary funds, equity funds, bond funds, mixed funds)

- Valuation indices by type of funds are obtained from a professional association and used to calculate flows (see below)

## 2.2. *The available sources on the asset side (sources by sector)*

- General Government:
  - State: number of defined quoted shares, own funds of unquoted shares
  - Other general government: broad categories of assets at acquisition value
- Balance of Payments: stocks and flows for bonds, quoted shares and mutual fund shares
- Credit institutions and security dealers:
  - Stocks valued at market value or acquisition value depending on the intention of the holder (sell, keep to maturity, long term relationships)
  - Holding gains and losses in the profit and loss account
- Mutual funds:
  - stocks at market value
- Insurance companies:
  - Stocks at market value and acquisition value
- The survey by custodians covers flows and stocks at market value of bonds, quoted shares, mutual fund shares by holding sectors. It is used to ascertain the accounting data and to split the residual between non financial corporations and households

## 2.3. *The implementation of the basic accounting identity in the French financial accounts*

- In the French financial accounts, the liability side is first compiled and then split into the different holding sectors on the asset side subject to the rule :

total asset = total liability

- When stocks and flows are available independently, adjustments are made in order to get a coherent revaluation.
- Our basic definition of revaluation draws on the hypothesis that the stock + half of the flow only are valued during the accounting period:

$$V_T = (S_{T-1} + 1/2 F_T) * i_T$$

(with  $i_T$  representing the valuation index)

- Then, when stocks at market value are not directly available (mainly on the asset side), they can be calculated as valued cumulated flows using an index (see hereafter the way this index is compiled) according to the following formula :

$$S_T = (S_{T-1} + 1/2 F_T) * (1 + i_T) + 1/2 F_T$$

Indeed :

$$S_T = S_{T-1} + F_T + V_T + K_T$$

$$S_T = S_{T-1} + F_T + (S_{T-1} + 1/2 F_T) * i_T$$

#### 2.4. Definition of valuation indexes

- The compilation of stocks as valued cumulated flows requires the use of indexes that are usually directly calculated from data sources on the liability side (bond database, quoted shares database), provided stocks and flows at market value are available in these data sources.
- Then, they are used on the asset side in a way that the assets and corresponding liability are assigned the same value.

→ the index  $i_T$  is calculated as follows :

$$1+i_T = \frac{SMV_T - 1/2 F_T}{SMV_{T-1} + 1/2 F_T}$$

or (if the information on change in volume is available) :

$$1+i_T = \frac{SMV_T - 1/2 (F_T + K_T)}{SMV_{T-1} + 1/2 (F_T + K_T)}$$

→ Besides, when interests accrued during the accounting period T ( $IA_T$ ) are considered as being reinvested in the financial asset, the index  $i_T$  is calculated as follows:

$$1+i_T = \frac{SMV_T - 1/2 (F_T + IA_T - IA_{T-1})}{SMV_{T-1} + 1/2 (F_T + IA_T - IA_{T-1})}$$

That is, the change in the interest accrued stock is treated as a supplementary flow (which also participates in the calculation of the index).

- The above mentioned formulas imply the existence of stocks at market value and of flows in the data sources. But when either stocks or flows information is missing in the source, one has to rely upon proxy market valuation indexes.

- First case : stocks at market value are not available (this is the case for data from the BoP source for provisional and semi-definitive vintages of account)

=> proxy indices from comparable markets are used (ex: index for resident bonds used for foreign bonds, foreign stock market and exchange indices for foreign quoted shares). The calculation drawing on these proxy indices will be revised. In any case, it is important to use the largest market index possible.

- Second case : flows are not available (for instance, this is the case for the mutual fund shares database)

=> the outstanding amounts of mutual fund shares at market value are available at each end of period but not the net investment in mutual fund shares (the flow).

⇒ Thus, market indices for each type of mutual funds (monetary, shares, bonds, mixed) are used to “extract” the revaluation information from the stocks at market value with the following formula :

$$V_T = \frac{i_T}{2+i_T} \times (SMV_{T-1} + SMV_T)$$

(this formula is derived from our basic hypothesis related to our definition of revaluation as :

$$V_T = (S_{T-1} + 1/2 F_T) * i_T, \text{ as will be shown later )}$$

Different indices are used for the liability side and for the asset side. They thus give rise to an adjustment in order that the valuation of the portfolio for the asset side is the same as the valuation of the mutual fund shares on the liability side.

## 2.5. *The formulas*

- For each period or end-of-period (**T**), data quality requirements for national accounts imply to calculate:
  - a flow (**F**)
  - a revaluation (**V**)
  - a stock at market value (**SMV**)
- The sources are, depending on the data availability :
  - a flow (**f**)
  - an outstanding amount at market value (**smv**) from balance sheet; realised and unrealised holding gains or losses (**hg, hl**) from P&L account
  - a revaluation index (**i**)
  - an outstanding amount at gross acquisition value (**sav**), including provisions, from balance sheet; realised holding gains or losses (**rhg, rhl**) and possibly discount/premium accrued over the life of the bond (**da, pa**) from P&L account
- If outstanding amounts at market value and flows at transaction value are available (e.g. liability side for definitive accounts):
  - $SMV_T = smv_T$
  - $F_T = f_T$
  - $V_T = SMV_T - SMV_{T-1} - F_T$
- If outstanding amounts at market value are available (e.g. held-for-trading portfolios of credit institutions and mutual funds on the asset side, mutual funds shares on the liability side):
  - $SMV_T = smv_T$
  - The revaluation component has to be “extracted” from stocks at market value, drawing on the use of a valuation index:  $V_T = (smv_T + smv_{T-1}) * i_T / (2 + i_T)$

### Demonstration :

1) Basic input formulas :

$$\text{- formula 1 : } V_T = (smv_{T-1} + 1/2 f_T) * i_T = (smv_{T-1} * i_T) + (1/2 f_T * i_T)$$

$$\text{- formula 2 : } f_T = smv_T - smv_{T-1} - V_T$$

2) Then applying formula 2 in formula 1, we obtain :

$$V_T = (smv_{T-1} * i_T) + [1/2 * i_T * (smv_T - smv_{T-1} - V_T)]$$

$$\Rightarrow V_T + (1/2 * i_T * V_T) = (smv_{T-1} * i_T) + (1/2 * i_T * smv_T) - (1/2 * i_T * smv_{T-1})$$

$$\Rightarrow V_T (1 + i_T/2) = (smv_{T-1} * i_T/2) + (smv_T * i_T/2)$$

$$\Rightarrow V_T * (2 + i_T)/2 = (smv_{T-1} + smv_T) * (i_T/2)$$

$$\Rightarrow V_T = (smv_T + smv_{T-1}) * i_T / (2 + i_T)$$

→ NOTICE : if holding gains and losses are also available, the previous formula for revaluation becomes:

$$-V_T = +hg - hl$$

- Then, once valuation is compiled, flows are deducted from stocks and valuation :

$$F_T = smv_T - smv_{T-1} - V_T$$

• If flows are available (e.g. BOP data for provisional accounts):

$$- F_T = f_T$$

- Compilation of the revaluation component according to our definition :

$$V_T = (SVM_{T-1} + 1/2 F_T) * i_T$$

- Then stocks are compiled thanks to the valued cumulating flows methodology :

$$SVM_T = SVM_{T-1} + V_T + F_T = (SMV_{T-1} + 1/2 F_T) * (1 + i_T) + 1/2 F_T$$

• If outstanding amounts at gross acquisition value are available (e.g. held-to-maturity and available-for-sale portfolios of credit institutions):

$$- F_T = sav_T - sav_{T-1} - rhg + rhl$$

- Compilation of the revaluation component according to our definition :  $V_T = (SMV_{T-1} + 1/2 F_T) * i_T$

→ For bonds, when discount or premium are accrued over the life of the bond, the previous formula for flows becomes:

$$F_T = sav_T - sav_{T-1} - rhg + rhl - da + pa$$

- Then stocks are compiled thanks to the valued cumulating flows methodology :

$$SMV_T = SVM_{T-1} + V_T + F_T = (SMV_{T-1} + 1/2 F_T) * (1 + i_T) + 1/2 F_T$$

### 3. The new methodology for quoted securities under the who to whom financial accounts framework

#### 3.1. The compilation of stocks at market value

• Total outstanding amounts of securities issued by sectors are provided by securities issues databases in general at market value (as well as in nominal value).

➤ nominal value can be checked with balance sheet by sector :

- To assess the sector classification



- To add missing securities (private issues, issues abroad)
- Total outstanding amounts of securities held by sectors are provided by balance sheets in a certain number of cases :
  - Not always at market value (general government)
  - Not with detailed counterpart information (general government, credit institution, insurance companies quarterly)
- The who to whom split of stocks at market value is operated thanks to :
  - SbS reporting by institutions which is used when available (central bank, mutual fund, insurance companies annually)
  - Otherwise the new custodian reporting which is security-by-security and who to whom based. The classification of the holding sector is made by the custodians according to ESA95 sectors.
- Diffusion of reference tables to reporters and compilers:
  - For securities (Isin codes) : coordination with CSDB
  - For ESA 95 sectors: S11, S14, S15 as a residual for residents

<b>balance sheet</b>	<b>market value?</b>	<b>with sbs reporting</b>	<b>How to obtain counterpart information at market value?</b>
<b>central bank</b>	Yes	Quarterly	-> use sbs reporting by institution
<b>credit institutions</b>	Yes	No	-> use custodian reporting for counterpart
<b>mutual funds</b>	Yes	Quarterly	-> use sbs reporting by institution
<b>insurance companies</b>	Yes	annual	-> use annual sbs reporting by institution + custodian reporting for quarterly variations
<b>general government</b>	No	No	-> use custodian reporting for valuation and more details in counterpart
<b>non financial corporations</b>	NA	NA	-> use custodian reporting+estimation of holdings in foreign custodies
<b>households</b>	NA	NA	-> use custodian reporting+estimation of holdings in foreign custodies
<b>rest of the world</b>	NA	NA	-> use custodian reporting

### 3.2. *The compilation of flow and revaluation components*

- Sources for flows :
  - Securities issue DB: flows at transaction value
  - Securities holding DB: flows at transaction value, changes in volume and stocks for each triplet issuer/type of security/holder
- No other flows at transaction value:
  - P&L accounts are not detailed enough to correct changes in BS, in order to obtain flows at transaction value

- Changes in SbS stocks at market value provide only a proxy of flows at transaction value

• Algorithms for flows

- First step : Calculate a revaluation index  $i^{uv}$  from the securities holding DB for each issuer  $u$ /holder  $v$

With : Flow  $f^{uv}$  - Stock  $s^{uv}$  - Change in volume  $cv^{uv}$  :

$$1 + i^{uv} = \frac{s^{uv}_{t+1} - \frac{f^{uv} + cv^{uv}}{2}}{s^{uv}_t + \frac{f^{uv} + cv^{uv}}{2}}$$

- Control and limit the valuation indices by comparison with index for same type of security/same issuer sector in the security issue DB
- Second step : for each issuer  $u$ , keeping only the ratio  $x^v$  between the indices by holder  $v= 1$  to 8 and the holder  $v=1$ . To simplify the notation  $i^l=i$

$$x^1 = \frac{i}{i} = 1$$

$$x^2 = \frac{i^2}{i}$$

$$x^3 = \frac{i^3}{i} \dots\dots$$

- Third step : calculate  $i$  under the constraint :

total flow issue by  $u$  = sum of flows of  $u$  held by holders  $v$

- total flow by issuer from securities issue DB :  $Fu$
- indices by issuer/holder from step 2
- the stocks and changes in volume from financial accounts  $S^{uv}$  and  $CV^{uv}$

$$F^u = 2 \sum_{v=1}^8 \frac{S^{uv}_{t+1} - x^{uv}(1+i) \times S^{uv}_t}{1 + x^{uv}(1+i)} - \sum_{v=1}^8 CV^{uv}$$

Notice :  $i$  is obtained by iteration, beginning with  $(1+i)=1$  and then  $(1+i)=(1+i+\varepsilon)$ , about 10 times :

$$\varepsilon^u = \frac{\sum_{v=1}^8 \frac{S^{uv}_{t+1} - x^{uv}(1+i^u)S^{uv}_t}{1 + x^{uv}(1+i^u)} - \frac{F^u - CV^u}{2}}{\sum_{v=1}^8 \left[ \frac{x^{uv}S^{uv}_{t+1} - (x^{uv})^2(1+i^u)S^{uv}_t}{[1 + x^{uv}(1+i^u)]^2} + \frac{x^{uv}S^{uv}_t}{1 + x^{uv}(1+i^u)} \right]}$$

This is obtained with the following limited development :

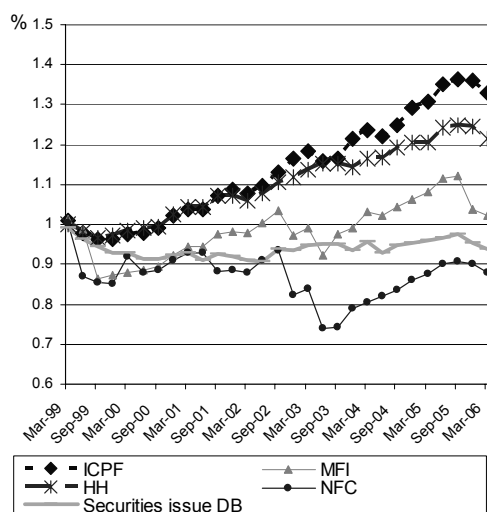
$$\frac{1}{1+x^u(1+i^u+\varepsilon^u)} = \frac{1}{1+x^u(1+i^u)} - \frac{x^u \varepsilon^u}{[1+x^u(1+i^u)]^2}$$

- This algorithm ensures that :
  - Revaluation is calculated and controlled in the same process as transaction flows
  - The stock / flow consistency is automatically ensured
  - Flows are balanced “vertically” (total issue by sector = sum of holdings of this sector)
  - The total holding for each sector is the sum of holdings by counterpart

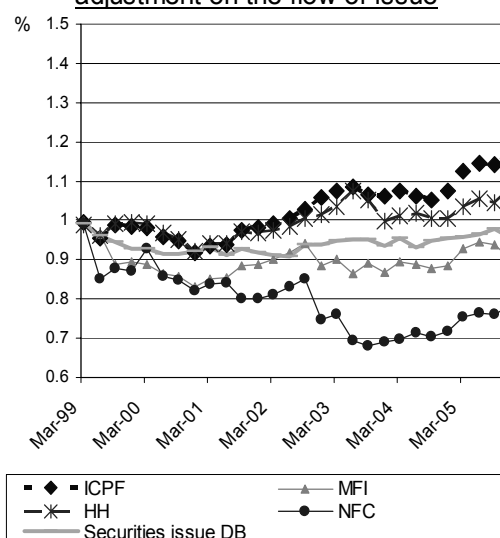
		debtor sector						Total
		crédit institutions	mutual funds	insurance companies	General government	Non financial	Rest of the world	
		2	3	4	5	6	8 ← $u$	
creditor sector	central bank	1	$F^{21}$					Horizontal sum
	credit institutions	2	$F^{22}$					Horizontal sum
	mutual funds	3	$F^{23}$					Horizontal sum
	insurance companies	4	$F^{24}$					Horizontal sum
	General government	5	$F^{25}$	and so on...				Horizontal sum
	non financial	6	$F^{26}$	$F^{36}$				Horizontal sum
	Households	7	$F^{27}$	$F^{37}$				Horizontal sum
	Rest of the world	8	$F^{28}$	$F^{38}$				Horizontal sum
	Total	$v$	$F^2$	$F^3$	$F^4$	$F^5$	$F^6$	Vertical sum =

$$F^{uw} + CV^{uw} = 2 \frac{S_{t+1}^{uw} - x^{uw}(1+i^u)S_t^{uw}}{1+x^{uw}(1+i^u)}$$

Valuation indices collected from the previous bond holder database (no distinction by issuer), compounded, split by holding sector



Valuation indices collected from the previous bond holder database (no distinction by issuer), compounded, split by holding sector, modified with the algorithm-based adjustment on the flow of issue



#### 4. The special case of unquoted shares and other equity

##### 4.1. The available sources

- Unquoted shares :

Own funds at book value in balance sheet databases (valuation at acquisition cost):

=> For MFIs (S122) and OFIs (S123) excluding mutual funds:

- supervisory exhaustive database for balance sheets (BAFI) which provides quarterly information on stocks ; then flows are derived from stocks

=> For other sectors - insurance companies (S125), financial auxiliaries (S124) and non financial corporations (S11) :

- For flows, monthly information on flows from commercial courts (issuances, redemptions,...) crossed with a sample database managed by the Banque de France (FIBEN) on annual balance sheets
- For stocks, exhaustive database of fiscal balance sheets managed by the National statistical institute (SIE), annual information available with a two-years delay

#### 4.2. The formulas

- Unquoted shares :

- $F_T = f_T$  (net variation of own funds at book value for unquoted companies)
- Stocks are only available at book value in the form of own funds in balance sheet databases. The method according which the market value of stocks is calculated depends on the timeliness of the availability of book value data.

1) When aggregated own funds at book value are available (which is the case for financial corporations shares at any vintage of account ; by contrast, for non-financial corporations, it is only the case at definitive (N-3) accounts)

=> Stocks at market value are equal to aggregated own funds at book value of one branch time the “capitalisation ratio” calculated for this branch on quoted companies with an adjustment for liquidity

*Definitions :*

OFUS<sub>i</sub> = Own funds at book value for the unquoted shares of one of the 11 NACE branches *i*

OFQSi = Own funds at book value	}	of quoted companies belonging to NACE branch <i>i</i> with own funds larger than 10 euros millions
MVQSi = market value		

MVUS = total market value of unquoted shares issued

*Formula :* 
$$MVUS = \sum \left( OFUS_i \times \frac{MVQS_i}{OFQS_i} \times 0.75 \right)$$

2) As long as aggregated own funds at book value are not available (for non-financial corporations, it is the case at provisional (N-1) and semi-definitive (N-2) accounts)

=> Stocks at market value are compiled thanks to the valued cumulating flows methodology applied to the last available N-3 stocks, re-valued with a suitable index (cylindred rate of increase in the market value of companies discounted by 25%).

***Definition :***

For MVQS = market value of quoted companies of any branch

*Formulas :*

Index *i* is such as: 
$$i_T = \frac{MVQS_T}{MVQS_{T-1}} \times 0.75$$

*Formula :* 
$$MVUS_T = (MVUS_{T-1} + 1/2F_T) * i_T + 1/2F_T$$

- Revaluation is then deducted form the difference between the variation of stocks and flow.
- Other equity

- $F_T = f_T$  (net variation of capital for other equity companies)
- Stocks are only available at book value in the form of own funds in balance sheet databases. There is no market value compilation process. Nonetheless, as own funds include reserves which incorporate valuation, they may be considered as partly valued at market price
- This implicit valuation component is extracted and, thus, differentiated from pure transaction, thanks to the following calculation :
  - Flows are computed as the variation of the mere capital (which is approximately equal to own funds less reserves)
  - Then valuation = difference between the variation of stocks (including reserves) and flows (excluding reserves)