Working Document

"Accrual Accounting Measures for NIPA Time Series"
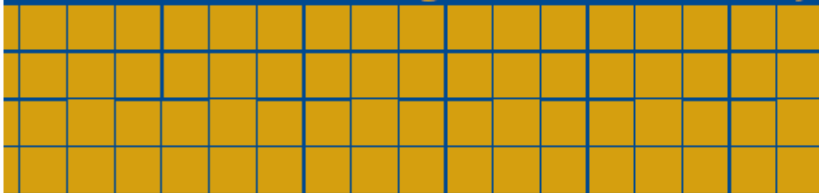
Government Division Accrual Accounting Benchmark Research Team

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Measuring the Nation's Economy.

BEA
BUREAU OF ECONOMIC ANALYSIS
U.S. DEPARTMENT OF COMMERCE

EXECUTIVE SUMMARY

The Accrual Accounting Benchmark Research Team of the Government Division, Bureau of Economic Analysis, presents this report, which is designed to enhance the use of accrual accounting theory and practice within the U. S. National Income and Product Accounts (NIPAs). The overall objective of the Accrual Accounting Team is to provide assistance in transitioning the NIPAs toward international standards of government economic accounting such as those promulgated by the *System of National Accounts* (*SNA 1993*). The attached "Working Document" represents an interim progress report on research towards this objective.

First, the team report states a broad definition of accrual accounting that is consistent with the *SNA 1993*. Second, the report provides a general methodology, including flow charts, for evaluating the possibility of converting NIPA cash-basis series to an accrual standard of recording. The conversion evaluation is broken down into two phases: 1) *Can* a series be converted?; and 2) *Should* a series be converted? Multiple factors affecting each of these decisions are presented. Third, the report lists four methods or tools that can be used if a decision is made to convert a NIPA series to an accrual basis. These four suggested techniques are: 1) time-shifting; 2) indicator series; 3) econometric method; and 4) coefficient method. The latter two approaches are not generally employed at BEA. The report also includes tables showing the current cash versus accrual status for various Federal and State and local government series of NIPA current receipts and expenditures.

While the Accrual Accounting Team may eventually recommend the conversion of one or more existing NIPA cash-basis series, the primary focus of the team is to assist NIPA analysts in making and implementing an appropriate conversion decision. Towards that end, the team is presently engaged in investigating different NIPA series for possible accrual conversion. The team also hopes to contribute to a learning process in which BEA staff achieve a better understanding of the cash versus accrual nature of their data sources and the extent of consistency between the timing of estimates on the income and product sides of the national accounts.

ACCRUAL ACCOUNTING MEASURES FOR NIPA TIME SERIES

Why is Accrual Accounting Important?

The measurement of economic events that occur over a period of time has become increasingly complex in the 21st century. There is now a widespread push toward accrual accounting as a way of increasing the international comparability of national economic accounting standards. For purposes of both government and corporate decision-making policy as well as causal analysis, it is important to measure economic events in the time period when they actually occur (e.g., the time of service provision) as opposed to the period when monetary transactions are made. In some cases, payments under government social programs, such as Medicaid grants, are dependent on formulas tied to personal income; inaccurate revenue estimation may lead to under- or overpayment of program benefits. More generally, accrual measurement of economic series is important for the accurate evaluation of economic trends over time.

Definitions

The *SNA 1993* defines accrual accounting in the following way: "Flows are recorded at the moment of accrual within the accounting period—that is, the moment economic value is created, transformed, exchanged, transferred or extinguished" (*SNA*, §3.3(b)). However, the *SNA* permits flexibility in recording certain transactions, particularly income taxes, by extending the acceptable recording period for accrual purposes.[1] The Accrual Accounting Team favors a definition that encompasses key elements of economic events that occur over a period of time. In general, income should be recorded when earned and expenditures when the associated goods or services are

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[1] ". . .all taxes should be recorded on an accrual basis in the *SNA*, i.e., when the activities, transactions or other events occur which create the liabilities to pay taxes. However, some economic activities, transactions or events, which under tax legislation ought to impose on the units concerned the obligation to pay taxes, permanently escape the attention of the tax authorities. It would be unrealistic to assume that such activities, transactions or events give rise to financial assets or liabilities in the form of payables and receivables. For this reason the amounts of taxes to be recorded in the System are determined by the amounts due for payment only when evidenced by tax assessments, declarations or other instruments, such as sales invoices or customs declarations, which create liabilities in the form of clear obligations to pay on the part of taxpayers. Nevertheless, in accordance with the accrual principle, the times at which the taxes should be recorded are the times at which the tax liabilities arise. For example, a tax on the sale, transfer or use of output should be recorded when that sale, transfer or use took place, which is not necessarily the same time as that at which the tax authorities were notified, at which a tax demand was issued, at which the tax was due to be paid or the payment was actually made. Some flexibility is permitted, however, as regards the time of recording of income taxes deducted at source" (*SNA*, §8.49).

provided/delivered. The latter definition is consistent with the core accrual flow principle embodied in the above *SNA* statement.

Regarding implementation of the basic *SNA* accrual definition, the team recommends that NIPA published series that include one or more cash-basis data elements only be revised if substantial progress towards full accrual recording can be made; i.e., most of the cash-basis estimates can be converted to an accrual basis. Minor statistical changes are not recommended.

Many economic activities and corresponding flows may stretch out over time; choosing a specific moment or period for accrual recording can therefore be difficult. The *SNA 1993* provides the preferred time of accrual recording for some of the common economic flows and transactions (§3.92-§3.112):

Transaction/Flow	**Moment or Period of Accrual Recording**
Output or production	When process of production takes place
Intermediate consumption of a good or service	When good or service enters the production process
Exchange and transfer of non-financial assets	When legal ownership of assets passes
Exchange and transfer of services	When services are provided
Exchange and transfer of distributive transactions such as compensation, interest, social insurance contributions and benefits, etc.	When claims arise or are built up
Imports and exports	When change of ownership occurs
Taxes	When the underlying transactions and flows which give rise to the tax liability occur
Changes in inventories:	
Additions to inventories	When products are purchased, produced or otherwise acquired
Subtractions to inventories	When products are sold, used up as intermediate consumption or otherwise relinquished

Evaluation Criteria for Estimate Conversion

Attached is the table stub for Current Receipts and Expenditures that highlights the government sector of the NIPAs. The team is in the process of evaluating each line item, including subcomponent estimates, to determine the current accrual versus cash status of the estimates.

When evaluating whether or not to convert a NIPA series from a cash basis to an accrual basis, there are two important questions that must be addressed. The first question is best answered by the individual analyst: *Can* the series be converted to an accrual basis? The second question is ultimately the decision of the estimate review team: *Should* the series be converted to an accrual basis? (Flow Charts 1 and 2 are graphical representations of the following text.)

Can it be Converted?

This question asks whether it is technically feasible to create accrual estimates for a given series. This question can best be answered by the individual analyst working on a particular series. The analyst would have the most knowledge about the nature of particular series as well as related source data that may be available. There are several criteria to consider when determining whether a series can be converted to accrual accounting:

A. <u>Source Data Availability</u> – Are annual source data available on an accrual (e.g., liability) basis? For instance, the IRS publishes annual income tax liability data in its *Statistics of Income* (*SOI*) publication. If explicitly-labeled accrual source data are unavailable, are there sufficient knowledge and data available to construct reasonable annual accrual estimates? For instance, if you know that retailers always remit sales taxes to the state in the quarter after the quarter when the sale occurred, then you could accurately produce an accrual series by simply shifting quarterly tax collections data (cash basis) into the previous quarter.

B. <u>Data Timeliness</u> – If there is a way to obtain annual accrual estimates as explored in the previous criteria, are the data available in a sufficiently timely manner to be useful in generating NIPA estimates? Specifically, at a minimum, will data be available for incorporation into the earliest open revision year during an annual revision?

C. <u>Current Estimate Methodology</u> – Would it be possible to generate current monthly/quarterly accrual estimates that would be consistent with the annual accrual estimates ultimately published? The methodology could involve shifting cash data, or it might also involve using an indicator series (see below). For example, one might estimate monthly personal income taxes based on the changes in personal income.

D. <u>Revision Size</u> – It is also appropriate to consider the size of resulting revisions on an accrual basis versus the revisions that are currently shown on a cash basis. In general, if revisions are substantially larger on an accrual basis than on a cash basis, this

might indicate that a proposed new methodology for current estimates may not be accurate enough to justify conversion to an accrual basis.

Flow Chart 1 takes these criteria into consideration and illustrates the evaluation process for determining whether an estimate can be converted to an accrual basis. Although this flow chart is a useful tool, some subjectivity by the analyst would remain in evaluating acceptable levels of revision size and volatility. If a series makes it all the way to the "possibly convert" box (i.e., can technically be converted), it still may not ultimately be converted to accrual in the NIPAs based on considerations in the next section, "Should it be converted?"

Should it be Converted?

This question is based on a more aggregate view of the national accounts. It may be the case that an estimate technically could be converted to accrual accounting but should not be because of its affect on related measures in the NIPAs. Once an estimate has gone through the previously described evaluation process and is deemed a possible conversion candidate, other considerations must be presented to the review team so that they can make a decision on whether a series should be converted. Although the review team will ultimately decide, it is the job of the analyst to present relevant information on several factors influencing this decision:

      A. <u>Interdependencies, NIPA Consistency</u> – What other NIPA series would be affected by converting an estimate to accrual accounting? For instance, there could be an inconsistency in NIPA savings measures if SECA social insurance contributions were converted to an accrual basis without also converting self-employed personal income taxes.

      B. <u>Volatility</u> – Is the accrual version of a series considerably more or less volatile than the cash-basis series? In principle, this concern could be considered irrelevant, but the source of the change in volatility should be examined.

      C. <u>Presentational Implications</u> – What would be the known effects on various NIPA presentational materials? For instance, if all Federal series were converted to an accrual basis, this would change the reconciliation table format, and a great deal of tax detail would be lost (withheld, final settlements, refunds, etc.), as it would no longer be relevant on an accrual basis.

      D. <u>Time Series Continuity</u> – Would the conversion create any discontinuity/inconsistency in the time series? In some cases, an accrual time series could be generated, but for only a portion of the overall time series. In such cases, there may be an awkward break where the series switches from cash to an accrual basis. Would it be possible to create an acceptable bridge? Is a series break acceptable?

Flow Chart 2 takes these considerations into account and illustrates the evaluation process for determining whether an estimate should be converted to an accrual basis. The

chart will not be used directly by the review team, but it helps show how the team might consider certain factors. Although the review team will make the decision on whether or not an estimate should be converted to accrual accounting, when discussing the above considerations in a proposal, analysts can express their own opinions on the matter. The case for or against conversion to accrual will, in principle, be made by the analyst, so their opinions may prove to be quite influential.

Methods and Tools of Accrual Conversion

A robust connection between theory and practice is a key element of accrual estimation. If it is recommended that a given NIPA cash-basis series should be changed to accrual-basis measurement, the analyst will naturally want to know what practical tools or methods are available to implement such a conversion. Accrual conversion methods can be classified in different ways. Four approaches are suggested here that may overlap in practice. Methods three and four below, the econometric and coefficient techniques, are actually extensions of the indicator series approach.

The Accrual Accounting Team's recommended "toolkit" for conversion of NIPA cash-basis series is not intended to be a static package. Over time, and in collaboration with groups of researchers in and outside of the Government Division, the team may refine and elaborate on presently available conversion techniques. This conclusion is especially applicable to methods three and four, which are largely untried at BEA.

1) **Time-shifting.** This is a relatively simple approach to accrual recording. The total amount or a fixed percentage (e.g., 25 percent) of a given cash- or payment-basis economic estimate is moved back into a previous month, quarter or calendar year. Time-shifting, of course, provides only an approximation to true accrual recording and may not fully reflect the timing pattern of (and changes over time in) the underlying economic event. This technique may not use all of the available source data; however, it may be a convenient and timely substitute for other, more data-intensive accrual conversion techniques.

2) **Indicator Series.** The accrual timing of a given cash estimate is approximated by duplicating the timing of a known, comparable indicator series. For example, the timing of a particular employer/employee social contributions estimate may be based on the pattern of a more aggregated economic series, such as wages and salaries or proprietors' income. This method, of course, depends on the validity and reliability of the economic connection between the original data and selected indicator series.

3) **Econometric Method.** The econometric method can be complex and employ many more variables for accrual estimation than the techniques listed above. It will work best if the regression parameters are based on a long time series of reliable historical data. Such an indirect approach, not generally used at BEA, should undergo extensive testing against alternative estimation techniques before it is applied to current estimation on a

regular basis. Constraints of time and data gathering resources, of course, may limit the feasibility of some econometric methods.

Econometric modeling is especially useful in accrual accounting when data for the dependent variable are only available with a periodic lag and thus are not available for the current estimation period. Econometric modeling can establish a relationship between the dependent variable and independent variables during a historic time period when data for all relevant variables are available. If the independent variables are also available for the current time period, then the dependent variable can be brought forward to the current period by using a mathematical function that characterizes the relationship between the dependent and independent variables in the historic period.

An example of a linear econometric model is:

$$Y_t = \sum_{i=1}^{k} \beta_i X_{it} + \varepsilon_t$$

where Y is the dependent variable which is to be converted to accrual accounting; the X variables are the independent variables upon which the Y variable depends; the βs are the coefficients of X which describe the relationship between Y and X; and ε is the stochastic variable that accounts for irregularities in the data and unpredictable random forces. Using this regression model, one would apply the betas to the relevant independent variables in the current period to produce Y, the dependent variable, on an accrual basis for the current period.

The choice of independent variables is an important consideration in designing an econometric model. Extensive research should be done on theoretical and pragmatic relationships between variables before a model is proposed. Variables in econometric models must be retested frequently to ensure that the relationships have not changed. If an unexpected change in the estimated dependent variable occurs, it may often be possible to trace it to a change in a specific independent variable. Changes in relationships may be the result of regime change, revised input data, re-estimated seasonal adjustments, value fluctuations, and so forth.

4) **Coefficient Method.** The coefficient technique is a potentially new approach to accrual estimation at BEA. It combines elements of the indicator series and econometric modeling methods discussed above.

The following set of requirements is associated with the coefficient method:

a.   The series or variable that is to be estimated on an accrual basis (variable A) must have a matching, highly correlated series (variable B).

b.   Variables A and B must both be available for period t-n…t-1 on an accrual basis.

If these two requirements can be fulfilled, then it is possible to apply the coefficient method when variable A is not available in the current period (period t), but an accrual estimate of the variable is required for the current period.

The coefficient approach is based on the presumed stability over time of the relationship between variables A and B. The relationship between the two variables can be estimated through regression analysis as discussed above. Thus, the following econometric relationship is estimated:

$$A_{t-n...t-1} = \beta \, B_{t-n...t-1} + \varepsilon_t$$

The coefficient or beta (β) in the above equation captures the relationship between variables A and B. (It is assumed that the error term in the regression model (ε) is identically and independently distributed and that it has a mean value of zero.) Given β, which is derived using historical data for the period t-n…t-1, and variable B or some method to estimate variable B in period t, then the value of variable A can be computed for period t. Again, if both variables A and B are measured on an accrual accounting basis, the value derived for variable A in period t will be estimated on an accrual basis. As mentioned above, the coefficient method works best when variable B is available in period t. However, if a composite variable, say C, which contains variable B as a subcomponent, is available in period t, and if variable C can be decomposed to extract variable B, then variable A can be estimated on an accrual basis for period t.

Consider the following four-step process:

Step 1:   Estimate the relationship between variables A and B using data for the period t-n…t-1 to obtain a measure of that relationship in the form of a regression coefficient, beta (β).

Step 2:   (a) Identify variable B for period t or,

            (b) Identify composite variable C for period t, which contains variable B.

Step 3:   If 2(b), then decompose composite variable C_t to obtain variable B_t.

Step 4:   Obtain variable A for period t using the following equations:

            (a) If 2(a), $A_t = \beta B_t$ or,

            (b) If 2(b), $A_t = \beta (B_t$ which is derived from C_t).

If 2(b) applies, and therefore 4(b), then estimators should ensure that the methods employed to decompose variable C actually produce a reliable value for variable B. If 2(a), and therefore 4(a) apply, then the estimation process here resembles the "econometric method" discussed above.

It is important to note that application of the accrual conversion methods described above may vary according to the intended time period of NIPA estimation—i.e., months, quarters, or years. The availability of necessary data for a given accrual method may vary according to the length of the estimate cycle. This factor will also affect the size of revisions required for previously published estimates (e.g., accrual-basis annual revisions of monthly NIPA estimates for which only cash-basis data are available).

Applying the tools of accrual conversion is often difficult. These difficulties are implied by the flow chart-based discussion in the previous section. Timely information may not be available, including core revenue and expenditure data as well as associated indicator series necessary for accrual modeling. Accrual conversion methods may be applicable to annual economic estimates but not, on a timely basis, to monthly or quarterly current estimates. There may also be problems in converting economic series to an accrual basis when interdependent series remain on a cash basis.

Conclusion

This Working Document has provided a succinct definition of accrual accounting as espoused by the *SNA*. It has delineated methods for determining whether an economic series can be and should be converted to an accrual accounting basis; helpful flow diagrams augment the text. Finally, the document provides a set of tools that can be applied to the task of converting series from a cash to an accrual basis.

The information provided here is intended to present a systematic approach that BEA may use to convert, where necessary, NIPA time series from a cash to an accrual accounting basis. As the ideas expressed in the document are implemented by estimators of NIPA series, the U.S. national accounts will conform more closely with international standards. The latter outcome is a stated BEA strategic plan objective.

Flow Chart 1
Can Estimate Be Converted to Accrual?

Is the estimate currently on a cash basis?

— YES → Do annual accrual source data exist?

Is the estimate currently on a cash basis? — NO → NO ACTION

Do annual accrual source data exist? — NO → Are there the required knowledge and data to derive annual accrual estimates?

Do annual accrual source data exist? — YES → Would data be available for earliest open year of AR?

Are there the required knowledge and data to derive annual accrual estimates? — YES → Would data be available for earliest open year of AR?

Are there the required knowledge and data to derive annual accrual estimates? — NO → DON'T CONVERT

Would data be available for earliest open year of AR? — NO → DON'T CONVERT

Would data be available for earliest open year of AR? — YES → Is there a way to derive current monthly/quarterly accrual estimates consistent with annuals?

Is there a way to derive current monthly/quarterly accrual estimates consistent with annuals? — NO → Is the annual series volatile?

Is there a way to derive current monthly/quarterly accrual estimates consistent with annuals? — YES → Would annual revisions be significantly larger on an accrual basis than a cash basis?

Is the annual series volatile? — YES → DON'T CONVERT

Is the annual series volatile? — NO → POSSIBLY CONVERT

Would annual revisions be significantly larger on an accrual basis than a cash basis? — YES → DON'T CONVERT

Would annual revisions be significantly larger on an accrual basis than a cash basis? — NO → POSSIBLY CONVERT

Flow Chart 2
Should Estimate Be Converted to Accrual?

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CAN the estimate          YES      Does this estimate      YES      Is the review team
technically              ------->  affect estimates in    ------->  comfortable with impacts
be converted to accrual?           other branches?                  on related estimates ?        NO
(Based on Flow Chart 1)                    |                                    |
        |                                 NO                 YES                |
        NO                                 |        -----------------------------
        |                                  v       /                            
        v                         Will conversion <                Is the review team
    /‾‾‾‾‾‾‾\                      change            YES            comfortable with changes    NO
    DON'T                         the volatility of --------->     to estimate volatility ?
    CONVERT                       this                                       |
   /_____\                    estimate?                 YES             |
                                       |        -----------------------------
                                      NO       /
                                       v      /
                              Will conversion cause      YES     Is the review team
                              significant               ------>  comfortable with          NO        /‾‾‾‾‾‾‾\
                              presentational                     required                           DON'T
                              changes in BEA data?              presentational changes?             CONVERT
                                       |              YES                 |                          _____/
                                      NO        ------------------------- 
                                       v       /
                              Would conversion cause     YES     Is the review team
                              discontinuity/inconsistency ----> comfortable with these    NO
                              in the time series?               inconsistencies?
                                       |                                |
                                      NO                               YES
                                        \                            /
                                         v                          v
                                          /‾‾‾‾‾‾‾‾‾‾\
                                         <  CONVERT  >
                                          _____/
```

Federal Government Current Receipts
[Billions of dollars] Seasonally adjusted at annual rates

SERIES	2006-I	STATUS
Current receipts	2473.2	Mixed
Current tax receipts	1518.2	Mixed
Personal current taxes	1032.5	Mixed
Income	1032.5	Mixed
Withheld	847.8	Accrual
Declarations and settlements	372.2	Cash
Less: Refunds	187.5	Cash
Other	0.0	n.a.
Taxes on production and imports	101.1	Accrual
Taxes on corporate income	374.3	Accrual
Taxes from the rest of the world	10.4	Accrual
Contributions for government social insurance	925.6	Mixed
Employer contrib. for gov social insurance	432.9	Mixed
Old-age, survivors, disability, and hosp insurance	376.7	Accrual
Old-age, survivors, and disability insurance	No Data	Accrual
Hospital insurance	No Data	Accrual
Unemployment insurance	46.5	Mixed
State unemployment insurance	38.4	Mixed
Federal unemployment tax	7.4	Accrual
Railroad employees unemployment insurance	2.7	Accrual
Federal employees unemployment insurance	2.3	unidentified
Railroad retirement	2.7	Accrual
Pension benefit guaranty	2.3	Accrual
Veterans life insurance	3.6	Accrual
Workers' compensation	2.5	Unidentified
Military medical insurance	2.2	Unidentified
Employee and self-employed	467.9	Mixed
Old-age, survivors, disability, and hospital insurance	422.2	Mixed
Employees	377.3	Mixed
Old-age, survivors, and disability insurance	No Data	Mixed
Hospital insurance	No Data	Mixed
Self-employed	44.9	Cash
Supplementary medical insurance	43.3	Accrual
State unemployment insurance	0.4	Accrual
Railroad retirement	1.5	Accrual
Veterans life insurance	0.4	Accrual
Income receipts on assets	23.3	Mixed
Interest receipts	15.0	Mixed
Rents and royalties	8.3	Mixed
Current transfer receipts	32.2	
From business	17.5	Accrual
From persons	14.7	Cash

Federal Government Current Expenditures

[Billions of dollars] Seasonally adjusted at annual rates

SERIES	2006-I	STATUS
Current expenditures	2637.9	
Consumption expenditures	803.6	Accrual
Current transfer payments	1522.0	
Government social benefits	1148.8	
To persons	1145.5	Mixed
Benefits from social insurance funds	956.5	
Old-age, survivors, & disability insurance	514.3	Mixed
Hospital & supplementary medical insurance	335.8	Accrual
Unemployment insurance	40.7	Unidentified
State	28.2	Unidentified
Railroad employees	0.3	Unidentified
Federal employees	0.6	Unidentified
Special Unemployment benefits	0.7	Unidentified
Railroad retirement	2.5	Accrual
Pension benefit guaranty	1.3	Accrual
Veterans life insurance	0.0	Accrual
Workers' compensation	2.5	Unidentified
Military medical insurance	2.2	Unidentified
Veterans benefits	36.8	Unidentified
Pension and disability	34.1	Unidentified
Readjustment	2.7	Unidentified
Other	No Data	Unidentified
Food stamp benefits	29.4	Unidentified
Black lung benefits	0.6	Unidentified
Supplemental security income	35.2	Unidentified
Direct relief	51.8	Unidentified
Earned income credit	51.8	Cash
Other	35.3	Unidentified
To the rest of the world	3.0	Unidentified
Interest payments	257.5	Mixed
To persons and business	122.7	Mixed
To the rest of the world	134.8	Accrual
Subsidies	54.7	Mixed

S&L Government Current Receipts and Expenditures

(Billions of dollars) Seasonally adjusted at annual rates

SERIES	2006 I	STATUS
Current receipts	1,755.40	Mixed
Current tax receipts	1,211.30	Mixed
Personal current taxes	293.4	Cash
Taxes on production and imports	851.4	Accrual
Taxes on corporate income	66.4	Accrual
Contributions for government social insurance	24.8	Cash
Income receipts on assets	76.7	Mixed
Interest receipts	64.1	Mixed
Dividends	2.5	Mixed
Rents and royalties	10.1	Cash
Current transfer receipts	450.5	Mixed
Federal grants-in-aid	351.3	Cash
From business (net)	38.2	Mixed
From persons	61.0	Cash
Current surplus of government enterprises	-7.8	Cash
Current expenditures	1,742.70	Mixed
Consumption expenditures	1,256.20	Accrual
Government social benefit payments to persons	390.4	Cash
Interest payments	95.8	Mixed
Subsidies	0.4	Cash