Fiscal Period Closing in REA Accounting Information Systems

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Abstract. Fiscal period closing and opening enables to set the initial state of an economic agent, transfer accounting information between REA accounting information systems, and allows for limiting the number of transactions in the REA system that would otherwise grow indefinitely. The cost of this operation is removing some – well defined - historical data in otherwise completely traceable economic history of an agent.

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1 Introduction

At first look, the concept of *fiscal period* seems unnecessary in the REA accounting information systems. Account balances in REA information systems are obtained as sums of economic events (McCarthy 1982), and the information in the REA system, thanks to domain rules specified by REA ontology, is always consistent. Many accounting researchers such as (Kirkegaard 1997, McCarthy 2011 personal communication) argue that financial statements produced for the predefined fiscal periods are unreliable, mainly because the duration of company's value adding processes is often different than the duration of the fiscal period. In the REA accounting information systems, the financial statements can be generated on demand, thus providing the precise, up-to-date, clear, complete and reliable information at any time needed.

However, when implementing the REA accounting information systems it turns out that closing and opening the accounts is not only useful, but in fact necessary, for the following reasons:

- It enables to set the initial state of an economic agent. In one of the recent projects, REA Technology has developed an application for simulating business ecosystems under various market conditions, with the REA-based ERP system managing hundreds of thousands economic transactions generated in each simulation run (Intelligent Agents Simulation, 2011). One of the user requirements for the software was to use the final state of a company obtained by one simulation run as an initial state for another simulation run, but without including all the transactions from the previous simulation.

- It enables to transfer a company's accounting information from a traditional accounting system to an REA-based accounting system, or from one REA based accounting system to another.
- It prevents the list of economic events to grow indefinitely. Legislation in various countries specifies how long the transactions must be kept in the accounting information systems. There are business reasons or company policies for accounting information system *not* to keep the information older than required by the legislation, as well as technical reasons – the growing lists becomes increasingly expensive to manage, in terms of computational and administrative resources.

Please note that the mechanism of fiscal period closing in REA information systems does not require it is executed at predefined time intervals. It can be executed whenever needed, whenever the abovementioned reasons become actual.

2 Fiscal Period Closing in Traditional Accounting

In the accounting literature there is a lot of confusion about the purpose of fiscal period closing. Most available references describe in detail *how* the fiscal period closing should be done and what procedures need to be performed, but little or nothing about *why* it is done and for what reasons.

In our opinion, in traditional accounting fiscal period closing serves three purposes:

1. Move the balance of revenue and expense accounts to the corresponding balance accounts.
2. Provide a way to move the state of the accounts from one fiscal period to the next.
3. Create a view of the company's present economic situation (also known as the financial statement or annual report).

These three purposes are explained below.

2.1 Moving the balance of revenue and expense accounts to the corresponding balance accounts

Traditional accounting distinguishes between *balance accounts* and *result accounts*. A *balance account* represents the value of economic resources under the company's control (assets) as well as the value of economic resources owed to another entity (liabilities and equity), whereas a *result account* represents the inflow or outflow of economic resources during the current accounting period. The accounting equation describes the relationship between these accounts:

$$Assets = liabilities + equity + revenue - expenses \quad (1)$$

Assets, liabilities and *equity* are all balance accounts, whereas *revenue* and *expenses* are result accounts.

During fiscal period closing, the balance of the result accounts is moved to the equity account. Thus each fiscal period starts with a zero balance on the expense and revenue accounts.

2.2 Moving the state of the accounts from one fiscal period to the next

In traditional accounting, a new set of accounts is created for each fiscal period. The first entry in each account contains either a debit or credit with an amount identical to the balance of the account from the previous period. This procedure ensures that there is never any doubt to which fiscal period a given entry belongs.

2.3 Financial statements

At the end of each fiscal period a statement is created, stating the balance of each of the accounts in the accounting system. The statement allows interested parties (shareholders, tax authority, etc.) to assess the economic situation of the company. Choosing the right set of accounts is important in order to achieve the right level of information and is therefore also, to a certain extent, regulated by legislation.

Fiscal period closing also runs checks allowing discovering and correcting the accounting errors that occurred during the fiscal period.

3 Fiscal Period Closing in the REA Model

We explain the mechanism of fiscal period closing on a simplified example where all exchanges represent cash purchases or sales, that is, no claims exist at any moment. This example is then extended by claims in section 4.

3.1 Transaction

Transaction is not part of the core REA ontology but is a useful concept that solves in a simple way several problems that would be otherwise much harder to solve. Transaction in the REA model is a set of economic events that for some well-defined reason occur simultaneously, that is, in the time interval shorter than the time resolution of the model. For example, if a shipment consists of multiple products, the packing slip is a transaction containing the economic events that the shipment consists of. In cash sale, the events for the items sold, the money paid, and the commitment to pay VAT represent a transaction. In money transfer process, the transfer of money, the use of computer systems involved in the money transfer, and the consumption of cashier's labor represent a transaction.

3.2 Fiscal Period Closing in the REA model

Similarly to traditional accounting, it would be useful to be able to close the accounts at the end of a fiscal period. First of all it would prevent the list of events to

grow indefinitely, which will make the accounts increasingly difficult to manage. Secondly a fiscal period closing mechanism as the one that exists in traditional accounting will make it easier to port a company's accounting information from one REA based accounting system to another.

In our proposed solution we will create two transactions: a *fiscal period initialization transaction* and a *fiscal period closing transaction*. These transactions will accomplish results similar to the fiscal period closing procedure in traditional accounting.

3.3 Example

The following example represents a simple REA based accounting system, in which several economic events have been registered in a fiscal period 2011. In this example all transactions represent full exchanges. In other words no claims exist in the accounts.

Table 1. Economic events in 2011

Date	Transaction	Provider	Recipient	Resource	Quantity
02-27-2011	1	Vendor 1	Company 1[1]	Chair	10
02-27-2011	1	Company 1	Vendor 1	USD	400
02-28-2011	2	Vendor 2	Company 1	Table	10
02-28-2011	2	Company 1	Vendor 2	USD	900
06-03-2011	3	Company 1	Customer 1	Chair	4
06-03-2011	3	Company 1	Customer 1	Table	1
06-03-2011	3	Customer 1	Company 1	USD	300

Based on the events in Table 1, we can calculate the total changes for each of the resources for each of the agents; increment is represented by a positive number and a decrement by a negative number.

[1] The name *Company 1* instead of just *Company* indicates that the REA model is not trading-partner centric and due to independent view can provide accounting for more than one enterprise in the business network or business group.

Table 2. Changes in resources in 2011

Agent	Resource	Quantity
Company 1	USD	-1000
Company 1	Chair	6
Company 1	Table	9
Vendor 1	Chair	-10
Vendor 1	USD	400
Vendor 2	Table	-10
Vendor 2	USD	900
Customer 1	Chair	4
Customer 1	Table	1
Customer 1	USD	-300

Similarly to the rule of matching balances in traditional accounting, it is easy to see in the above table, that the sum of all quantities of a given resource always gives zero, for example, for the economic resource USD

$$-1000 + 400 + 900 - 300 = 0. \quad (2)$$

This is a result or the *law of conservation of economic resources in trade*[2], that is, every economic resource provided by an agent must be received by another agent.

We can create an artificial event that cancels out the result of the events that have been registered in the accounting system. As in the REA ontology every event must have both a provider and a recipient agent, the Fiscal Period Closing Transaction Agent (FPCTA) is the provider or recipient of the events in the financial period closing transaction.

Table 3. Fiscal period closing transaction (transaction 4)

Date	Transaction	Provider	Recipient	Resource	Quantity
31-12-2011	4	FPCTA	Company 1	USD	1000
31-12-2011	4	Company 1	FPCTA	Chair	6
31-12-2011	4	Company 1	FPCTA	Table	9
31-12-2011	4	FPCTA	Vendor 1	Chair	10
31-12-2011	4	Vendor 1	FPCTA	USD	400
31-12-2011	4	FPCTA	Vendor 2	Table	10
31-12-2011	4	Vendor 2	FPCTA	USD	900
31-12-2011	4	Customer 1	FPCTA	Chair	4
31-12-2011	4	Customer 1	FPCTA	Table	1
31-12-2011	4	FPCTA	Customer 1	USD	300

Since the fiscal period closing transaction cancels out the effect of all the transactions that have happened during the period, it is safe from an accounting point of view

[2] An economic parallel to Kirchhoff's current law, or continuity equation in fluid dynamics.

to delete all the transactions once the fiscal period closing has been performed. The only transaction that needs to be registered is a transaction that cancels out the effect of the fiscal period closing transaction itself. We call this transaction the fiscal period initialization transaction, and the corresponding agent fiscal period period initialization transaction agent (FPITA).

The transactions for the next period (2012) may therefore be something like shown in Table 4.

Table 4. Transactions in the next fiscal period

Date	Transaction	Provider	Recipient	Resource	Quantity
01-01-2012	1	Company 1	FPITA	USD	1000
01-01-2012	1	FPITA	Company 1	Chair	6
01-01-2012	1	FPITA	Company 1	Table	9
01-01-2012	1	Vendor 1	FPITA	Chair	10
01-01-2012	1	FPITA	Vendor 1	USD	400
01-01-2012	1	Vendor 2	FPITA	Table	10
01-01-2012	1	FPITA	Vendor 2	USD	900
01-01-2012	1	FPITA	Customer 1	Chair	4
01-01-2012	1	FPITA	Customer 1	Table	1
01-01-2012	1	Customer 1	FPITA	USD	300
01-07-2012	2	Company 1	Customer 2	Chair	6
01-07-2012	2	Company 1	Customer 2	Table	1
01-07-2012	2	Customer 2	Company 1	USD	400

In many cases it is only interesting to track the number of resources held be certain agents. In the example above it is important to track the amount of resources held by Company 1, whereas the resources held be Vendor 1, Vendor 2 and Customer 1 is not. We call agents for which we do not want to track resources *relaxed agents*. By removing uninteresting events from the fiscal period initialization transaction, we end up with the accounting information shown in Table 5.

Table 5. Transactions in the next fiscal period with relaxed agents

Date	Transaction	Provider	Recipient	Resource	Quantity
01-01-2012	1	Company 1	FPITA	USD	1000
01-01-2012	1	FPITA	Company 1	Chair	6
01-01-2012	1	FPITA	Company 1	Table	9
01-07-2012	2	Company 1	Customer 2	Chair	6
01-07-2012	2	Company 1	Customer 2	Table	1
01-07-2012	2	Customer 2	Company 1	USD	400

4 Handling Claims During Fiscal Period Closing and Opening

4.1 Handling Claims in Fiscal Period Closing in Traditional Accounting

In traditional accounting, the concepts of accounts receivable and accounts payable are important because they represent expected future events. During the fiscal period closing, the accounts receivable and accounts payable are simply aggregated and represented as an asset and a liability, respectively. As the consequence of the aggregation, the important information of who owes the company money, or to whom the company should pay, is not part of the company's financial statement. A separate accounting system is needed for keeping track of this information. This is typically called debtor accounting and creditor accounting.

4.2 Handling Claims in Fiscal Period Closing in the REA model

In the REA model, a separate accounting system is not needed for keeping track for debtors and creditors, because this information is already present in the events. We represent this information using the concept of an expected event. Expected event represents a claim of a recipient to the provider. Expected event types have been introduced in (Geerts, McCarthy 2000a), however, the fiscal period opening procedure requires actual instances of expected events being modeled explicitly.

Table 6. Debtor and creditor accounting using expected events

Date	Transaction	Kind	Provider	Recipient	Resource	Quantity
03-08-2011	1	Event	Company 1	Customer 1	Chair	4
03-08-2011	1	Event	Company 1	Customer 1	Table	1
03-08-2011	1	Expected event A	Customer 1	Company 1	USD	300
03-27-2011	2	Event (partially requiting A)	Customer 1	Company 1	USD	200
04-02-2011	3	Event	Company 1	Customer 2	Chair	6
04-02-2011	3	Event	Company 1	Customer 2	Table	1
04-02-2011	3	Expected event B	Customer 2	Company 1	USD	400

During fiscal period initialization, the unrequited amounts of expected events are aggregated for each agent and become events that are part of the fiscal period initialization transaction. We do not have to include expected events from the previous period if they have already been fully requited, see Table 7.

Table 7. Fiscal period initialization transaction with excepted events

Date	Transaction	Kind	Provider	Recipient	Resource	Quantity
01-01-2012	1	Event	Company 1	FPITA	Chair	10
01-01-2012	1	Event	Company 1	FPITA	Table	2
01-01-2012	1	Event	FPITA	Company 1	USD	300
01-01-2012	1	Expected event	Customer 1	Company 1	USD	100
01-01-2012	1	Expected event	Customer 2	Company 1	USD	400

One of the reasons for financial period closing transaction is to create a financial statement. The content of the financial statements is often regulated by legislation. Typically, the financial statement are required to contain only aggregated information about the claims but not specific information about which economic agents owe the company and which agents the company owes, and which resources. Therefore, the financial period closing transaction the provider or recipient of the expected events are the fiscal period closing transaction agent (FPCTA) and the Company 1, respectively, see Table 8.

Table 8. Fiscal period closing transaction with excepted events

Date	Transaction	Kind	Provider	Recipient	Resource	Quantity
31-12-2011	4	Event	FPCTA	Company 1	Chair	10
31-12-2011	4	Event	FPCTA	Company 1	Table	2
31-12-2011	4	Event	Company 1	FPCTA	USD	300
31-12-2011	4	Expected event	Company 1	FPCTA	USD	500

Please note that the expected events in the closing transactions do not correspond one-to-one to the expected events in the fiscal period opening transaction, although they represent the same amounts in changes of resources. It is a consequence of the fact that the opening transaction has to contain more information than the closing transaction is allowed to contain. The opening transaction must contain information about creditors and debtors, while the closing transaction does not have to.

5 Conclusions

In REA accounting information systems, the fiscal period closing and opening are the operations allowing for removing old events from the history of the economic agents and replacing them by aggregated events with the same effect on the resource balances. The key mechanism of closing and opening the fiscal period are the fiscal period closing transaction, and the fiscal period opening transaction, containing the events that nullify and initialize the agent state, respectively. As claims have to be

represented explicitly in the fiscal period closing and opening transactions, we use the concept of expected event to model the claim instance.

6 References

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