Money as Debt in REA and POA

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“Anyone who believes exponential growth can go on forever in a finite world with limited resources is either a madman or an economist.” (Kenneth Ewart Boulding).

Abstract. When issuing loans to their customers, banks create money, i.e. value, seemingly out of nothing. This represents an interesting challenge to REA modeling, where creating value out of nothing violates the second REA axiom. This paper presents a brief analysis of money-creation processes and REA and POA models of these processes.

1 How Banks Create Money

Regulators in most countries specify conditions under which commercial banks may provide loans to their customers. Best known are probably Fractional Reserve Requirements, which specify how much money a bank has to hold as a function of its liabilities. Commercial banks may typically lend their customers up to 10 times (depending on a country and time period) more than the bank’s “high powered money”, which are the bank’s deposit at the central bank plus bills and coins at the banks vault.

These rules allow commercial banks to provide liquidity to their customers (Diamond, Dybvig 1983, Diamond 1997), i.e. to create new money, up to the limit set by the regulators. This mechanism is closely related to money multiplier, which is an estimate of the maximum amount of money that commercial banks can create. The money commercial banks create represent real value, they can be exchanged to goods and services or converted to bills and coins.

Regulators often impose additional requirements limiting the amount of money the banks can create. For example, Basel III global regulatory standard (Basel III, 2014) imposes capital requirements calculated as a function of risk-weighted assets, which also limits the maximum amount that banks can lend.

In this paper we focus on the actual mechanism of creating new money by commercial banks at operational level. Specification of the rules the regulators impose on banks, such as the formulas specifying fractional reserve requirements or Basel III capital requirements can be modeled at policy level, and for the time being is out of scope of this paper.

2 REA Model of Money Creation

The mechanism of money multiplier, allowing commercial banks to create new money seemingly out of nothing, represents an interesting challenge in REA modeling, as it seemingly violates the second REA axiom (Geerts, McCarthy 2002).

The second REA axiom states that “All events effecting an outflow must be eventually paired in duality relationships with events effecting an inflow and vice-versa.” (Geerts, McCarthy 2002, page 12). The second axiom applies for both exchange and conversion processes, as inflow encompasses REA relationships take and production, and outflow encompasses use, consumption and give (Geerts, McCarthy 2002, Fig. 3).
Consequently, the second REA axiom for conversion process specifies that an economic resource cannot be created out of nothing, a resource can only be created by using or consuming another economic resources.

The REA model is illustrated below. Money is created whenever a bank lends money to a customer; likewise, money is destroyed whenever the customer pays the loan. Therefore, the REA model consists of two processes: the exchange process of providing the loan and the conversion process of creating and destroying money.

Loan Process is an exchange process, where Money is exchanged for Money. Bank provides Loan to a Customer, and in return, Customer pays the loan and the interest to the Bank. The REA model above is in the independent view.

Money Creation and Destruction Process is a conversion process. Money Creation event is paired in conversion duality with Money Destruction event, and with the Loan Administration event, consuming Bank’s resources. Money Creation event occurs simultaneously and creates the same amount of Money as the Loan event, and Money Destruction event occurs simultaneously and destroys the same amount of Money as Loan Payment event. It is uncertain how to express this operational level constraint in the REA model, see also the section on comparison of the REA and POA models.

Note that the Loan Administration event is necessary to fulfil causality, resulting from the second REA axiom for the conversion process, where the use or consume event must start before and end after the produce event, because a resource cannot be produced out of nothing. As Money Creation typically occurs before Money Destruction, we need a decrement event that would occur before Money Creation, therefore an event such as the Loan Administration event must be part of the model due to the second REA axiom.
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3 POA Model of Money Creation

The POA (Possession, Ownership, Availability) (Scheller, Hruby, 2016) model for the same scenario is illustrated below. The POA model also illustrates what the Customer does with the borrowed money. Adding the same process to the REA model is straightforward.

The POA model illustrates three agent roles, Bank, Customer and Customer’s Trading Partners, and resource flows, activities, deposits and withdrawals to agent’s repositories. The activity Provide Loan creates an economic resource Money. While possession and availability of the created Money is received by Customer in the Receive Loan activity, ownership of Money is deposited to the Loans repository of the Bank. When Customer pays the loan, possession and availability of Money is received by the Bank in the activity Receive Loan Payment, which reduces balance of the Loans repository (Money ownership) and destroys the resource Money.

Customer’s repository Debts represents negative ownership of Money. The repository Debts is negative, because the Receive Loan activity reduces its balance from the initial zero level, when availability and possession of Money is transferred from the Bank. Thus, after the Receive Loan activity the Customer has possession, availability and ownership of Money, which is deposited to the repository Money. This Money can be used by some value adding process, such as investment, necessary to generate Interest paid to the Bank.

Note that Bank’s activity Receive Interest Payment does not destroy Money, but deposits it into Money repository of the Bank.

4 Comparison of the REA and POA Models

In the REA model, Money Creation event occurs simultaneously with the Loan event, and Money Destruction event occurs simultaneously with Loan Payment event. This
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is a constraint at the operational level, however, it is uncertain how to express it in the REA model. REA has a similar concept of congruency\(^1\), characterized as “two classes and the association between them are simply combined into one class” (McCarthy, Geerts, Gal, 2916). However, in our case there is no direct association between these events, and we do not want to combine them into one. Therefore, congruency does not seem to be applicable. We want to express that an event in exchange process occurs simultaneously with an event in a conversion process, similarly as purchase of electricity occurs simultaneously with its consumption. Introducing a concept of transaction to the REA ontology would solve this problem. The POA model can express it by the concept of Activity, which as a collection of flows, withdrawals and deposits occurring simultaneously.

As the POA model does not have a concept of duality, an activity does not have to specify which resources have been used or consumed in order to create other resources. Therefore, an activity like Loan Administration does not have to be in the POA model, while it is necessary in the REA model to satisfy the duality. It should be noted that Loan Administration event in the REA model does not explain why Money is created; it is in the model merely to satisfy causality resulting from the second REA axiom.

Although the POA model does not have the concept of duality, POA models have processes that describe the purpose of the activities, at least for non-relaxed agents. For example, Bank participates in the process because it earns money from interest. Customer participates in the process because it allows him to invest and purchase benefits.

The POA model contains repositories, which in case of financial resources represent accounts. In REA, accounts are not explicitly modeled, therefore Loans and Debt are represented as Claims and must be derived from the economic events. For example, the balance of Loans account is a difference between sum of Loan events and a sum of Loan Payment events. Thus, both models can describe how much Customer owes the bank; in the POA model this information is represented by a balance of a repository and in the REA model as a claim derived from the events.

5 Conclusions

Some popular materials such as (Money as Debt, 2013) might indicate that money is debt, that is, they represent a view on money as a claim rather than an economic resource. Our analysis explained that creating debt explains how money is created by commercial banks, however, money is still an economic resource.

Comparison between the REA and POA model reveals different expression power of both models, and, which is interesting, none of the models is a subset of another. Both models also differ in their ability to guide a modeler to discover missing information.

6 References


http://www.bis.org/publ/bcbs270.pdf

\(^1\) A note for the reviewer: Are we right, that congruency cannot be used to model this constraint?
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