

## When a bank makes a loan, where does the money come from and where does it go?

Financial market plumbing drew little attention before 2008.

Perhaps *The Fountainhead* would have had the same impact were Ayn Rand to have made Howard Roark a plumber rather than an architect, but I doubt it.

With a tip of the hat to my late mother's uncle who installed plumbing in the Empire State Building, let me talk a little about financial plumbing, specifically, how money circulates—or doesn't.

Although I will focus on the infrastructure aspect of payments systems and not on what is “flowing through the pipes”, so to speak, it is helpful to first define and discuss two types of “money”.

Type 1 money may be held only by authorized banks only at the “central” bank. No person reading this sentence has ever held Type 1 money.<sup>1</sup>

Type 2 money may be held at any financial institution offering “money deposits”, by any natural or juridical person meeting certain criteria. Physical currency<sup>2</sup>, a Type 2 money, may be held even by minors, outlaws, etc. As I said, this is not the place to debate “what is money?” and for our purpose here it is easiest to think of Type 2 money as simply bank accounts.

Money types 1 and 2 are distinguished by *who* may possess it and *where* it may be possessed.

Anyone may possess Type 2 money anywhere.

Only authorized banks may possess Type 1 money and only at the central bank.

Thus, the answer to the question posed in the title of this note depends on the type of money loaned.

First, let us consider when a bank makes a loan of type 1 money.

- A. Since only authorized banks may possess Type 1 money, all Type 1 money lending/borrowing is interbank lending<sup>3</sup>. (In what follows I will assume all banks are “authorized” banks).
- B. Since nonbanks, e.g. persons, companies; cannot possess Type 1 money it is **impossible** for banks to lend or transfer Type 1 money to nonbanks. [please read that sentence again :0]
- C. Type 1 money only circulates among banks' accounts at the central bank.
- D. Type 1 money is not a physical object that literally “moves” among banks. Type 1 money is exclusively accounting money. When Bank Q lends to Bank Z, the former sends a secure message to the central bank requesting a certain amount be deducted from its account balance at the central bank and credited to the account of Bank Z at the central bank. After the central bank verifies the authenticity of the message(s) it makes numerical adjustments to the relevant account balances and informs the receiving and sending banks that the transfer is complete.

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<sup>1</sup> O.K., I am aware of exceptions. Willem Buiters informed me that certain officials at the Bank of England do have accounts at the Bank. If memory serves the Governor has a checkbook associated with account # 1.

<sup>2</sup> We may think of cryptocurrency similarly—a digital token held by anyone on a blockchain.

<sup>3</sup> For simplicity, I am ignoring the fact that banks may lend and borrow with the central bank and that certain entities in certain countries also have accounts at the central bank—most often the national treasury.

Below I present the balance sheet impact of an interbank loan of Type 1 money between Banks A and B.

Changes in Lending Bank A's Balance Sheet

January 15, 2020

(in US\$ millions)

Assets		Liabilities	
Deposit at Central Bank	-10		
Loan to Bank B	+10		
Net Other Assets	0		
Total Assets	0	Total Liabilities	0

Changes in Borrowing Bank B's Balance Sheet

January 15, 2020

(in US\$ millions)

Assets		Liabilities	
Deposit at Central Bank	+10	Borrowing from Bank A	+10
Net Other Assets	0		
Total Assets	+10	Total Liabilities	+10

Changes in Central Bank's Balance Sheet

January 15, 2020

(in US\$ millions)

Assets		Liabilities	
Net Other Assets	0	Deposit Account Bank A	-10
		Deposit Account Bank B	+10
Total Assets	0	Total Liabilities	0

If we sum the assets and liabilities of the banking system, we see that the interbank loan results in an increase in interbank lending (+10) and an increase in interbank borrowing (+10).

Consider now an additional interbank loan from Bank B to Bank C arising, let us say, from Bank B acting as an intermediary for another bank in the US money market ("fed funds market"—the market for funds

deposited at the Fed)<sup>4</sup>. Given the topology of the fed funds market network, this activity was at one point quite common<sup>5</sup>, i.e. most trading was funneled through the balance sheets of the major money center banks even when they were neither the ultimate lender nor borrower of funds.

We show changes in the balance sheet of Banks C and B below.

Changes in Borrowing Bank C's Balance Sheet  
January 15, 2020  
(in US\$ millions)

Assets		Liabilities	
Deposit at central bank	+10	Borrowing from Bank B	+10
Net Other Assets	0		
Total Assets	+10	Total Liabilities	+10

Cumulative Changes in Borrowing Bank B's Balance Sheet  
January 15, 2020  
(in US\$ millions)

Assets		Liabilities	
Deposit at central bank	0	Borrowing from Bank A	+10
Lending to Bank C	+10		
Total Assets	+10	Total Liabilities	+10

Now if we sum the assets and liabilities of the banking system, we arrive at an increase in interbank lending of +20 and an increase in interbank borrowing of +20. After the latest loan is registered, the central bank's balance sheet will show a cumulative decline in depository liabilities of 10 held by Bank A and an increase in depository liabilities to Bank C.

Notice two important facts related to interbank lending of Type 1 money:

- It is accomplished through a transfer of reserve balances from bank-to-bank without any change in the overall holdings of reserve balances.
- This result is neither dependent on the number nor size of the interbank loans.

Just like Vegas, all that happens in the interbank money market stays in the interbank money market.

<sup>4</sup> For a good description of the fed funds market see Goodfriend and Whelpley (1993) [https://www.richmondfed.org/~media/richmondfedorg/publications/research/special\\_reports/instruments\\_of\\_the\\_money\\_market/pdf/chapter\\_02.pdf](https://www.richmondfed.org/~media/richmondfedorg/publications/research/special_reports/instruments_of_the_money_market/pdf/chapter_02.pdf)

<sup>5</sup> See Bech and Atalay (2008), *The Topology of the Federal Funds Market*, ECB Working Paper # 986.

Let us now turn to lending of Type 2 money. Unlike the Type 1 interbank market—a wholesale market populated with specialist traders and brokers—most individuals have experience lending Type 2 money. Even if you have never had a bank account you might have loaned a friend lunch money or, if you have ever had a job you have undoubtedly worked before being paid which is, of course, a loan of sorts.

So, what *does* happen when a bank makes a loan of Type 2 money?

Consider a concrete example, a loan to purchase a motorcycle.

There is a loan preparation stage where the borrower presents information documenting an ability to pay, requests an amount to purchase the vehicle, and signs an application. Upon approval, the borrower signs a loan agreement including a terms and conditions sheet. The agreement will note the day the funds will be available to the borrower and there will be some arrangement—usually directly between the seller and the lender to place the legal title to the vehicle in the custody of the lender. This theoretically prevents the buyer from selling the vehicle before repaying the loan.

On the effective date, the balance sheet changes for the lending bank A are shown below:

Changes in Lending Bank A's Balance Sheet  
January 15, 2020  
(in US\$ thousands)

Assets		Liabilities	
Retail Loan to Z	+10	Z's Account Balance	+10
Net Other Assets	0		
Total Assets	+10	Total Liabilities	+10

The change in customer Z's balance sheet are shown below

Changes in Z's Balance Sheet  
January 15, 2020  
(in US\$ thousands)

Assets		Liabilities	
Deposit at Bank A	+10	Loan Owed to Bank A	+10
Net Other Assets	0		
Total Assets	+10	Total Liabilities	+10

Customer Z has taken the loan to purchase the motorcycle. To execute the purchase, Z sends a message to Bank A directing it to pay the dealer and authorizing the use of funds from Z's account at Bank A. The acceptable form of messages and how they are processed differ among national payments systems though international harmonization is occurring.

For example, in the case of a US check, the instruction would specify the name of the dealer/seller and include the standardized routing number (account address) of the buyer, Z. The dealer, after receiving the check from Z, appends to the check instructions to its financial institution (Bank B) as to the manner of the credit desired (e.g. a deposit account number). Bank B will credit the dealer's account (with differed funds availability perhaps) and then "present" the check to Bank A requesting payment.

Usually banks or their agents participate in periodic multilateral check clearing sessions. In circumstances where physical check presentation prevails, these physical exchanges—check presentation and acceptance—take place at a central clearinghouse often at the central bank<sup>6</sup>. In preparation for a clearing session, each bank aggregates and sums all claims on every other bank. The monetary total is the amount "due from" each other bank. Banks then meet bilaterally and "present" their claims in the form of bundled checks with the sum associated indicated on top. Presuming all the checks are accepted by both banks, and the arithmetic is correct, the two banks determine the net amount that is required to be transferred from one, the net debtor, to the other, the net creditor. In the fortuitous occurrence that the interbank claims net to zero, there no need for an interbank transfer. Each bank takes the checks presented to it and performs the appropriate internal customer accounting.

In the more likely event that, say, Bank A owes Bank B net, this obligation is registered on the account of the clearinghouse. This process continues until all bilateral net obligations are registered in a matrix of mutual claims. The clearinghouse then calculates the cumulative amount owed or due to every bank.

As a simple example. Suppose Bank A has total "dues from" Bank B summing \$10 million and Bank B has total "dues from" Bank A of \$9 million. The clearinghouse notes a net Bank A "due from" Bank B of \$1 million and a net Bank B "due to" Bank A of the same amount, \$1 million.  $B \rightarrow A$  \$1 million.

Now suppose Bank A has total "dues from" Bank C amounting to \$12 million and Bank C has total "dues from" Bank A totaling \$8 million. The clearinghouse registers a net Bank A "due from" Bank C of \$4 million and a Bank C "due to" Bank A of \$4 million.  $C \rightarrow A$  \$4 million.

Lastly, suppose Bank B has a total of "dues from" Bank C of \$11 million and Bank C has a total "dues from" Bank B of \$13 million. The clearinghouse registers a net Bank C "due from" Bank B of \$2 million and a net Bank B "due to" Bank C of \$2 million.  $B \rightarrow C$  \$2 million.

Bank A has two net entries, a net due from B of \$1 million and a net due from C of \$4 million for a total of \$5 million due from the "market".  $M \rightarrow A$  \$5 million.

Bank B has two entries, a net due to A of \$1 million and a net due to Bank C of \$2 million for a total of \$3 million due to the "market".  $B \rightarrow M$  \$3 million

Bank C has two net entries, a net due from Bank B of \$2 million and a net due to Bank A of \$4 million for a total of \$2 million due to the "market".  $C \rightarrow M$  \$2 million.

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<sup>6</sup> Phases in payments systems are usefully classified as either "clearing" which includes the processing of various messages and instructions; organization of claims "due to" and "due from"; and clarifying the net amount of funds each bank owes, or is due, from every other bank. These interlocking claims are then placed in a matrix showing whether each bank is net short (owes) or is net long (owed) funds from the market. The subsequent stage, when payment takes place is called "settlement". Put simply, clearing is the efficient determination of who owes who what and when. Settlement is the payment and receipt of funds owed and due determined in clearing.

The activity discussed above is known as the “clearing” aspect of payments processing. Essentially the amounts due to and from each bank have been clarified or distilled out of what might have been tens of thousands of checks written on each other<sup>7</sup>.

After clearing, settlement occurs. In our example, Bank B and Bank C may request the central bank to transfer deposit balances to Bank A; they may request an overnight<sup>8</sup> loan from Bank A or they may request loans from other banks in the system to fund their payments. The matrix is shown below.

		BANK A		BANK B		BANK C	
		DUE TO X	DUE FROM X	DUE TO X	DUE FROM X	DUE TO X	DUE FROM X
BANK A	DUE FROM X <-----	NA		10		12	
	DUE TO X ----->		NA		9		8
BANK B	DUE FROM X <-----	9		NA		11	
	DUE TO X ----->		10		NA		13
BANK C	DUE FROM X <-----	8		13		NA	
	DUE TO X ----->		12		11		NA
SUMS OF DUES TO & FROM		17	22	23	20	23	21
NET DUE FROM "MARKET" <--			5		-3		-2

Rather than making say 50,000 transfers to settle the amounts due in Type 2 money before aggregation, the system requires only two transfers of Type 1 money.

Of course, each bank must make the internal accounting entries for every transfer made to/from its customers' accounts. But it is important to understand that these adjustments to accounting balances in thousands of customer accounts do not require any direct transfer of value from one customer to another. Furthermore, although the total amount of “dues to” are \$63 million, total accounting adjustments of Type 1 money net to zero and gross Type 1 adjustments amount to \$10 million.

Now let us look at the balance sheets of Bank A and Bank B following settlement of the motorcycle payment pretending that this was the only transaction processed by both banks.

#### Cumulative Changes in Lending Bank A's Balance Sheet

January 16, 2020

(in US\$ thousands)

Assets		Liabilities	
Deposit at Central Bank	-10	Z's Deposit	0
Loan to Z	10		
Net Other Assets	0		
Total Assets	0	Total Liabilities	0

<sup>7</sup> In 1992, the Federal Reserve handled on average 75 million checks per day with an aggregate value of \$52 billion. By 2018, these numbers had fallen to 19 million and \$34 billion respectively. By number of checks handled, 2018 was the lowest total since 1965. (These figures exclude government checks and postal money orders handled).

<sup>8</sup> “Overnight” may be taken to mean until the next settlement session.

Z's deposit briefly increased by 10 and then fell by 10. The transfer of funds was enabled by a reduction in deposits at the central bank credited to Bank B.

Changes in Bank B's Balance Sheet

January 16, 2020

(in US\$ thousands)

Assets		Liabilities	
Deposit at Central Bank	+10	Seller's Deposit	+10
Net Other Assets	0		
Total Assets	+10	Total Liabilities	+10

Bank B receives an increase in its deposit balance at the central bank and credits the Seller's deposit account by an equivalent amount.

If we aggregate across the two banks we are in the same position as before—banks' depository liabilities have increased by 10 (now on the books of Bank B) and loans have increased by 10 (on the books of Bank A); total deposits at the central bank have not changed. The decrease in Bank A's account at the central bank is matched by the increase in Bank B's account there.

We now return to answer the question posed by the title of this note.

Lending Type 2 money begins with the money being created by the loan originator (Bank A).

Type 2 money then shifts location through accounting entries on bank balance sheets matched by accounting entries at the central bank. This would follow decisions by various actors, e.g. the vehicle dealer directs a payment to a nonbank banking with a third bank, the recipient of that payment directs a payment to a fourth bank, etc. How might this end?

There are several possibilities regarding the "ultimate" destination of created Type 2 money:

- A. It may circulate on the liability side of an indefinite number of banks (matched by a corresponding change in which bank is lending to Bank A through the interbank market). What matters is that the banking system fund the loan through issuing monetary liabilities regardless of how many times ownership of those monetary liabilities might change.
- B. It may be replaced (extinguished) with a nonmonetary liability issued by a bank. Examples of funding not customarily considered "monetary" are bonds, long term certificates of deposit, equity and repo financing.

When a bank loans Type 2 money, it first funds the loan with a monetary liability on itself that the borrower does not wish to hold. That Type 2 money, in the form of bank deposits, then gravitates to other banks becoming the funding source for them of an interbank loan to the originating bank. The originating bank may wish at some point to replace its funding source—an interbank loan—with a longer-term liability such as a bond, thereby extinguishing the Type 2 money it originally created. Alternatively, another bank in the loop may attract a depositor into a nonmonetary liability.

In the first instance, Bank A, the credit originator, identified a specific borrower and a specific source of funding—a depository liability that could be liquidated on demand by the borrower. It knew that Borrower Z wished to use the loan proceeds immediately and that it would have to quickly find another source of funding but it was confident that the banking *system* would recapture the funding that it had lost from Z from another person (or from a series of depositor/lenders) and that it would, at a reasonable cost, be able to tap into that source of funding either directly (raising new funding from nonbanks) or indirectly through the interbank market.

Though banks do not literally bring borrowers and lenders together to shake hands on a deal, the system-wide balance sheet necessity that all loans be funded, i.e. an increase in assets be matched by an increase in liabilities, suggests why banks are often called financial “intermediaries”. Although the bank making the loan does not, at the time, identify who will fund the loan, the banking system works to find a series of sources of funding, each usually for a much shorter duration than the duration of the loan.

Let us now summarize the answer to our original question.

Type 1 money is created by the central bank and resides only on the balance sheet of the central bank. It may be held only by banks or other entities authorized to hold Type 1 money, i.e. accounts at the central bank. An interbank loan is simply the transfer of existing Type 1 money from one bank account to another. Adjustments to the respective accounts are made by the central bank upon receipt of verified instructions from the sending bank. In this process no Type 1 money is created, its distribution among banks is simply changed. An interbank loan of Type 1 money does, however, lead to an increase in total “loans” and “borrowings” by the banking system. Banking system assets known as “fed funds loaned” increase and banking system liabilities known as “fed funds borrowed” increase by the same amount.

Type 2 money may be created by banks and held by anyone anywhere. When a bank makes a loan following appropriate preparation and documentation, it simply credits the borrower with an account balance (a liability of the bank) and records the loan as an additional bank asset. In the borrower’s accounts, the loan appears as a liability and the bank deposit appears as an asset. In order to use the proceeds of the loan, the borrower sends a message to their bank instructing it to use their account balance to fund a transfer of value to the account of the entity providing the borrower a good or service. Upon verifying that it is a valid request, the borrower’s bank does an accounting adjustment to the borrower’s account balance and undertakes to complete the transfer of value according to the instructions received. This transfer of Type 2 money among banks may continue indefinitely or a bank or series of banks may convert the monetary liability into a nonmonetary liability thereby extinguishing Type 2 money. The banking system balance sheet in that case will reflect an increase in loans and an equivalent increase in nonmonetary liabilities.

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