The Heart of Monetary Economics

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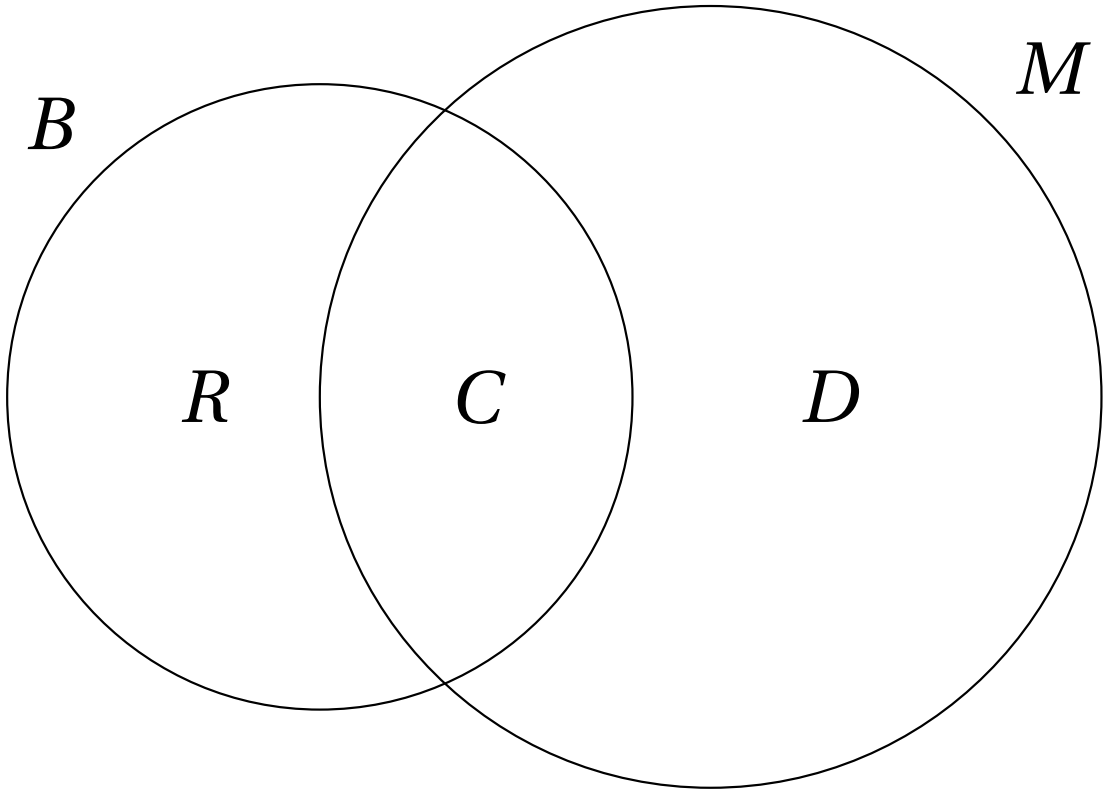
Visualizing Monetary Variables

We currently use a Venn diagram to visualize $M := C + D$ and $B := C + R$.



Venn Diagram Shortcomings

The Venn diagram does a great job of illustrating the definitions of B and M.

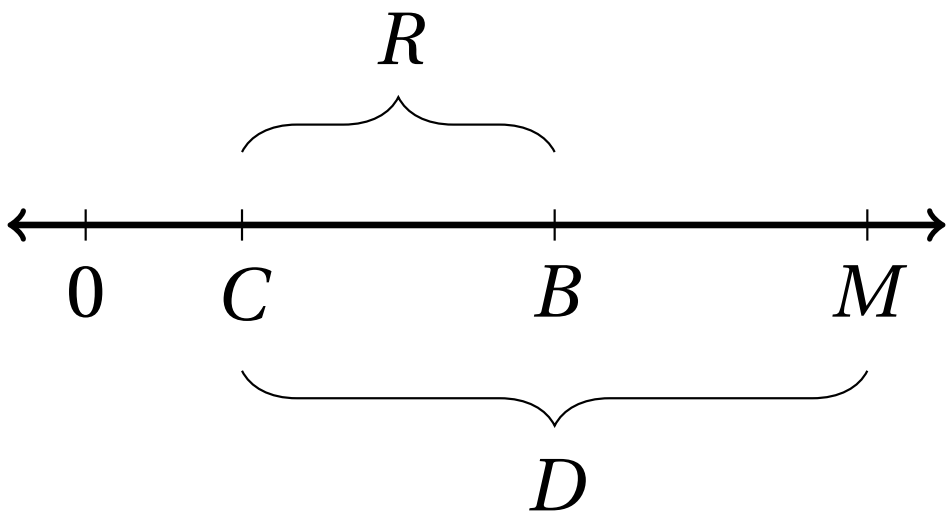
But that is all it does.

It does not offer an explanation for why it may be the case that $D > R$ or $M > B$.

It sheds no light on *how* money is created.

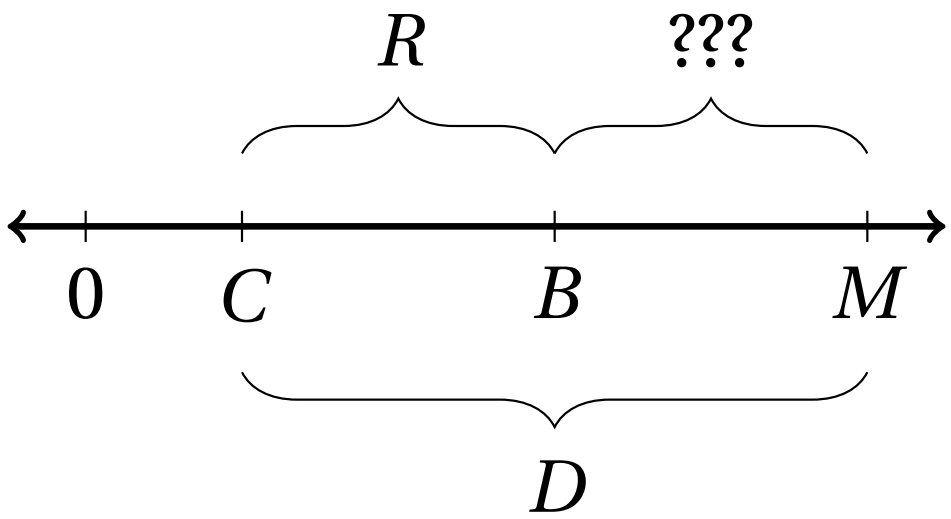
Toward a New Diagram

Depict $0 < C < B < M$ on a number line. Then R measures gap the between B and C, while D measures the gap from C to M.



An Unlabeled Gap

If we knew what determined the size of the gap $M - B$ (and $D - R$), then we could create a diagram that offered information on why $M > B$ and $D > R$.



Simplified Balance Sheet Approach

Let L denote aggregate loans and other debt owed to banks (e.g. bonds and overdrawn accounts).

Assume no owners' equity or illiquid debt owed by banks. This approach yields a simplified aggregate balance sheet for banks:

Assets		Liabilities	
Reserves	R	Liquid Deposits	D
Loans	L		

Simplified Balance Sheet Identity

The (assets = liabilities) identity for the simplified balance sheet is $R + L \equiv D$.

This is useful for describing deposit lending. Holding R constant, D increases with L.

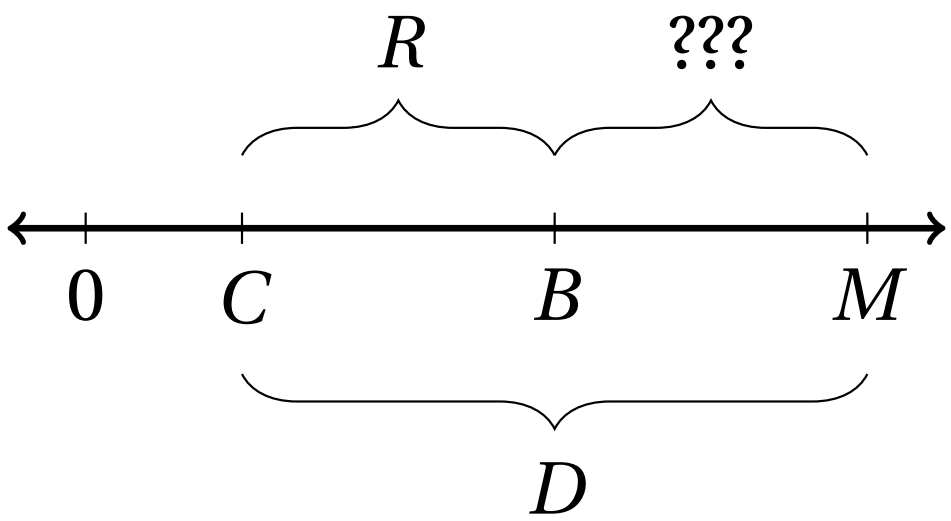
For currency lending, the increase in L is offset by the decrease in R, so there is no change in D.

More on this Identity

The simplified balance sheet identity implies

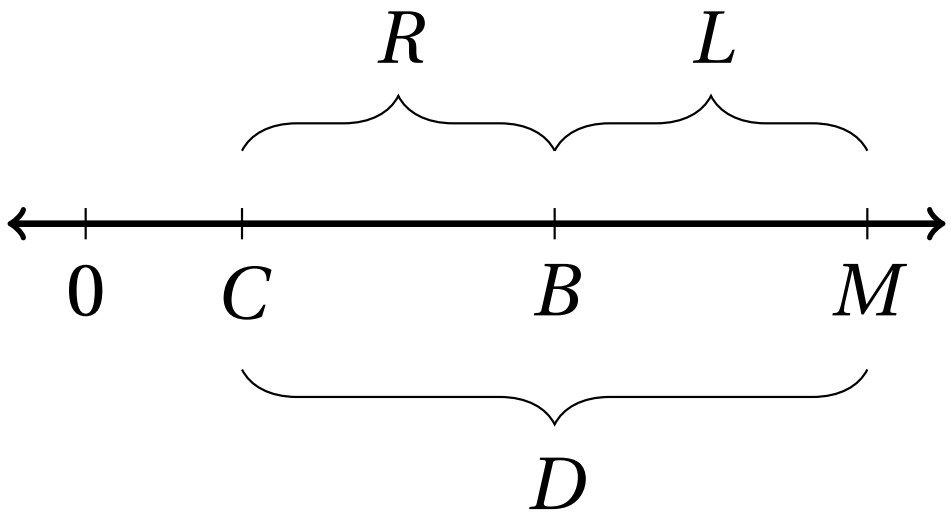
$$L \equiv D - R.$$

Recall that $D - R$ measures our missing gap.



Simplified Heart of Monetary Econ

Placing L into the missing gap yields this diagram:



From this, it's clear that $M \equiv B + L$, which illustrates money creation. As banks lend the money supply increases.

Toward a More Rigorous Heart

The simplified heart is not accurate, so it does not make much sense to show to-scale versions of it.

In reality, there is illiquid debt I (including illiquid deposits) owed by banks and owners' equity E.

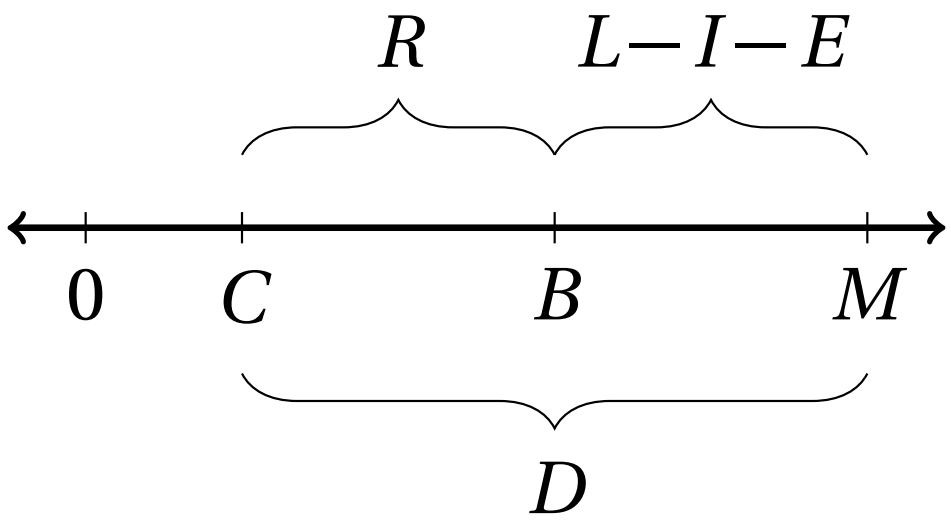
Assets		Liabilities & Equity	
Reserves	R	Illiquid Debt	I
Loans	L	Liquid Deposits	D
		Owners' Equity	E

Balance Sheet Identity

The (assets = liabilities + equity) balance sheet identity here is

$$R + L \equiv I + D + E.$$

This implies our missing gap is $D - R \equiv L - I - E$.



What is this Quantity?

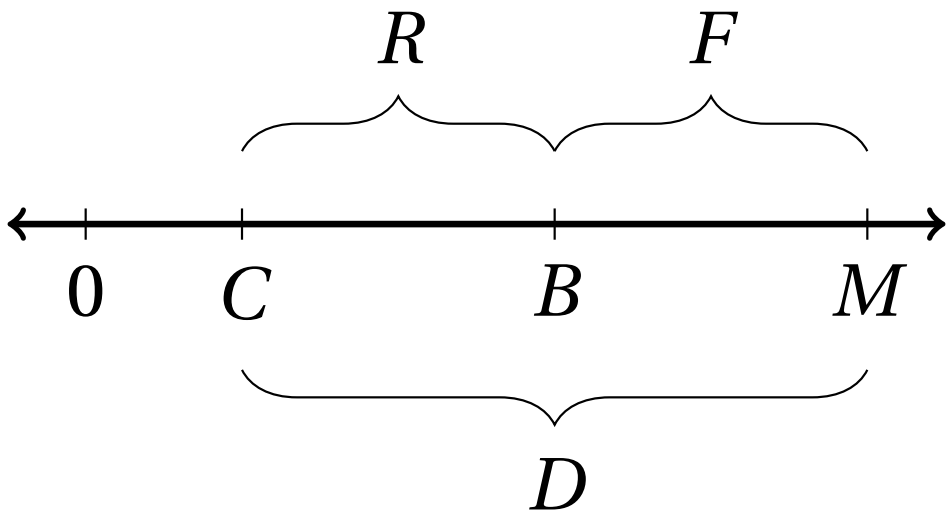
$L - I - E$ is illiquid financing provided by banks *net* of the amount of illiquid funds used to finance the banks themselves.

Following Zinn (2022), define "Net Financing" as

$$F := L - I - E.$$

We may place net financing F in what was the gap.

The Heart of Monetary Economics



It still describes money creation $M \equiv B + F$ and deposit lending $D \equiv R + F$.

The monetary Venn diagram illustrates only $M := C + D$ and $B := C + R$.

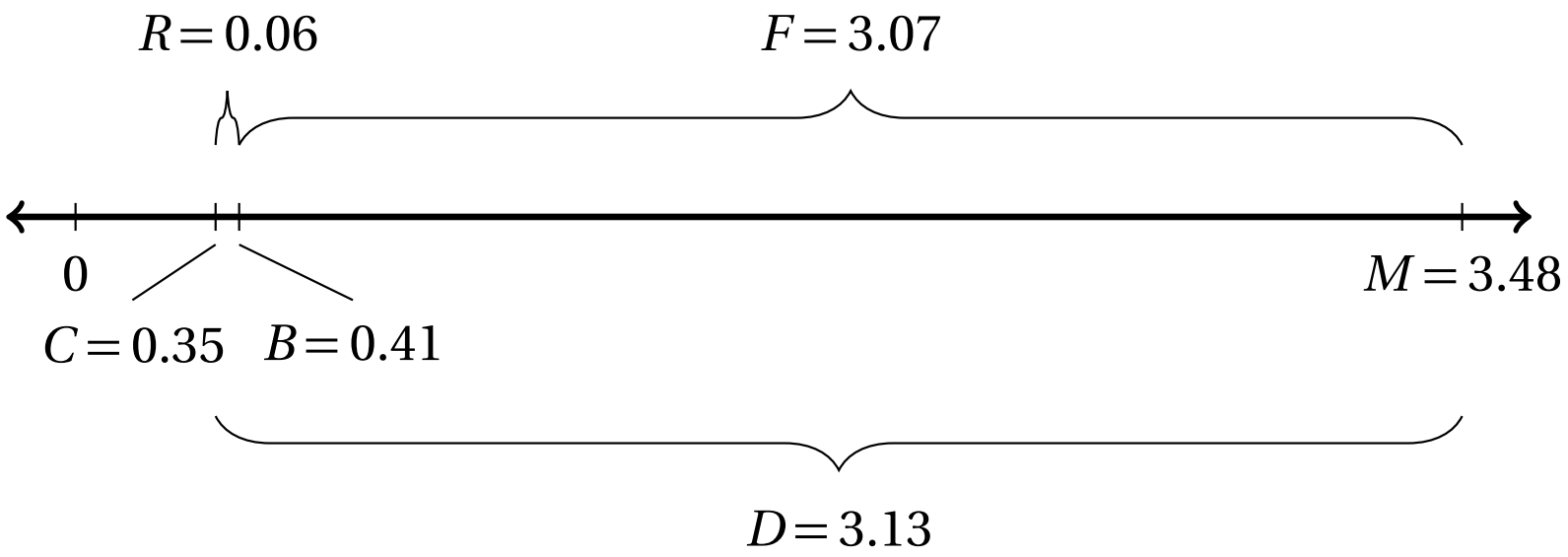
To-Scale Versions of the Heart

Showing students scaled versions may be valuable.

The scaling could help illustrate changes in economic conditions and policies.

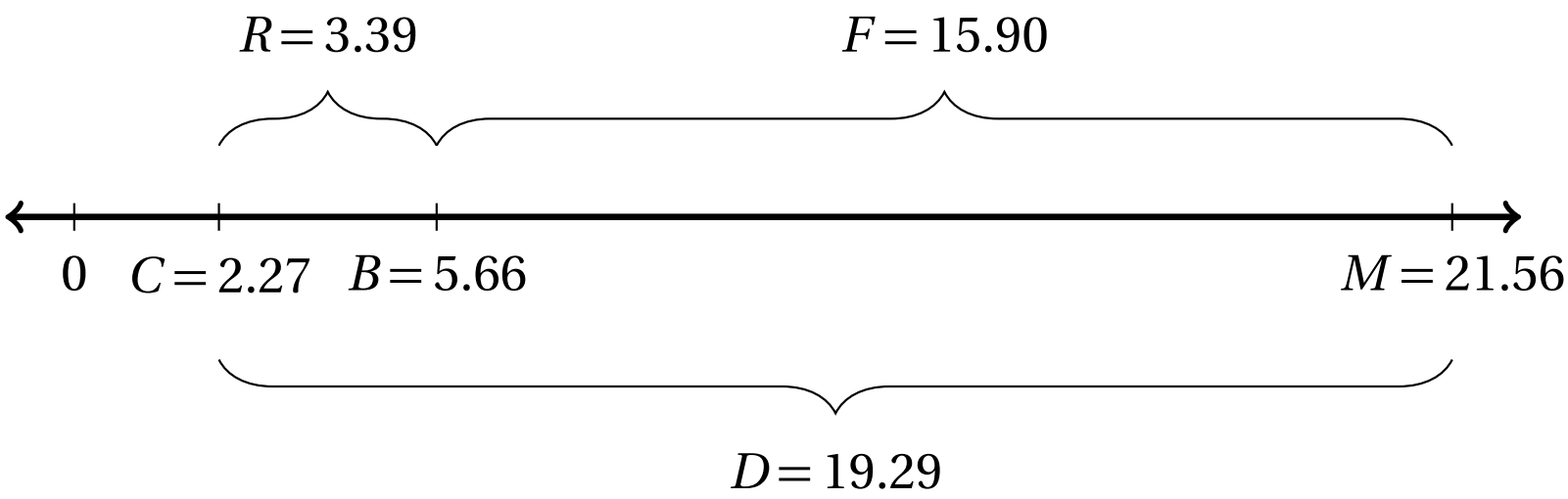
Liquidity traps, abundant vs. scarce reserves, quantitative easing vs. tightening, etc.

1994, Scarce Reserves



Source: Board of Governors of Federal Reserve System (US) and author's calculations. Net financing is $F = M - B$, currency in circulation is $C = B - R$, and aggregate liquid deposits are $D = M - C$, where M is M2 (M2SL), R is reserves of depository institutions (TOTRESNS) and B is the monetary base (BOGMBASE). All in trillions of US dollars.

2022, Abundant Reserves



Notice that $R > C$ here.

When $F < 0$

All variables in the heart are depicted as positive.

However, it is possible that $F < 0$.

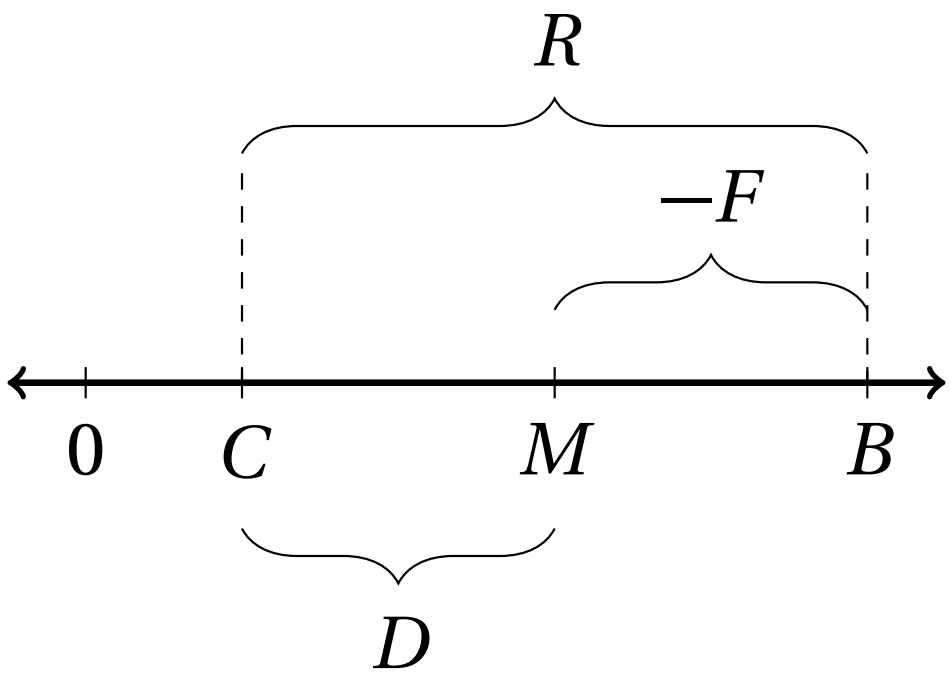
Occurs if $D < R$, which can happen as a result of:

- Stringent definition of money (e.g. M1 before March 2020)
- Financial crisis and/or a policy response (e.g quantitative easing and abundant reserves)

Recessed Heart

$F < 0$ if and only if $D < R$ and $M < B$.

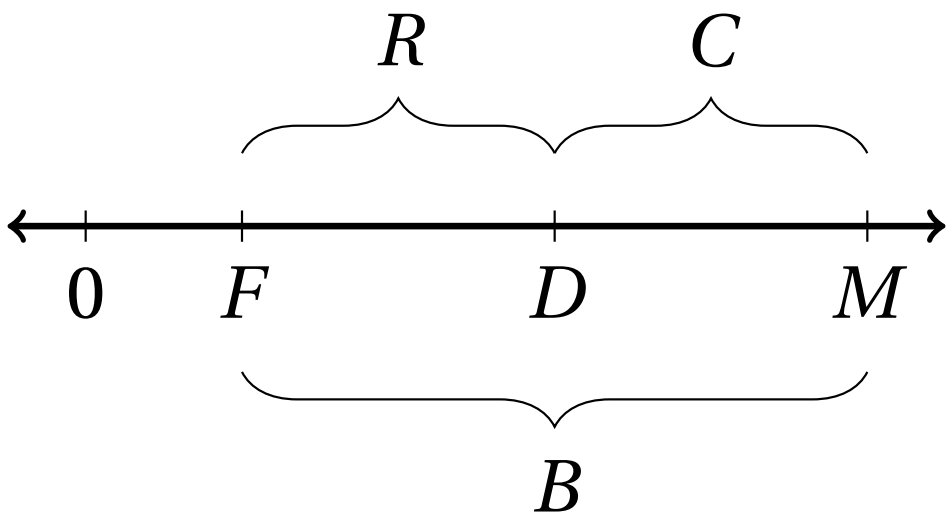
These relationships change the orders of some variables, resulting in a "recessed heart."



Another Heart

It is possible to construct another heart, which contains the same information as the original.

I prefer the original heart; it has F as a "gap" variable and places B on the axis, which makes envisioning money creation more natural (IMHO).

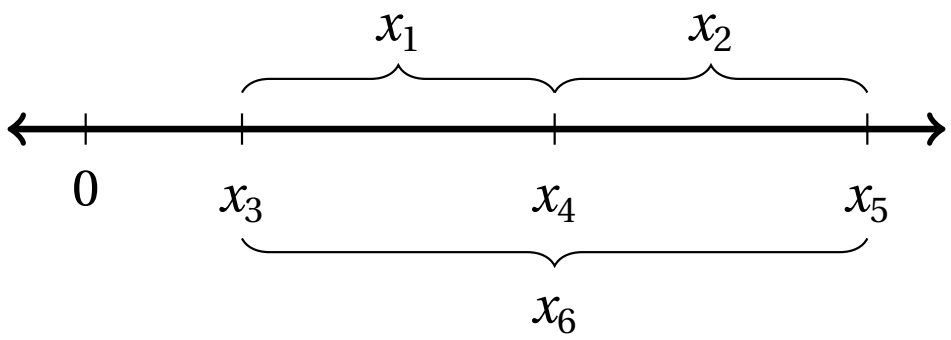


It's Just These Two

There are $6! = 720$ possible heart diagrams displaying B, C, D, F, M, and R.

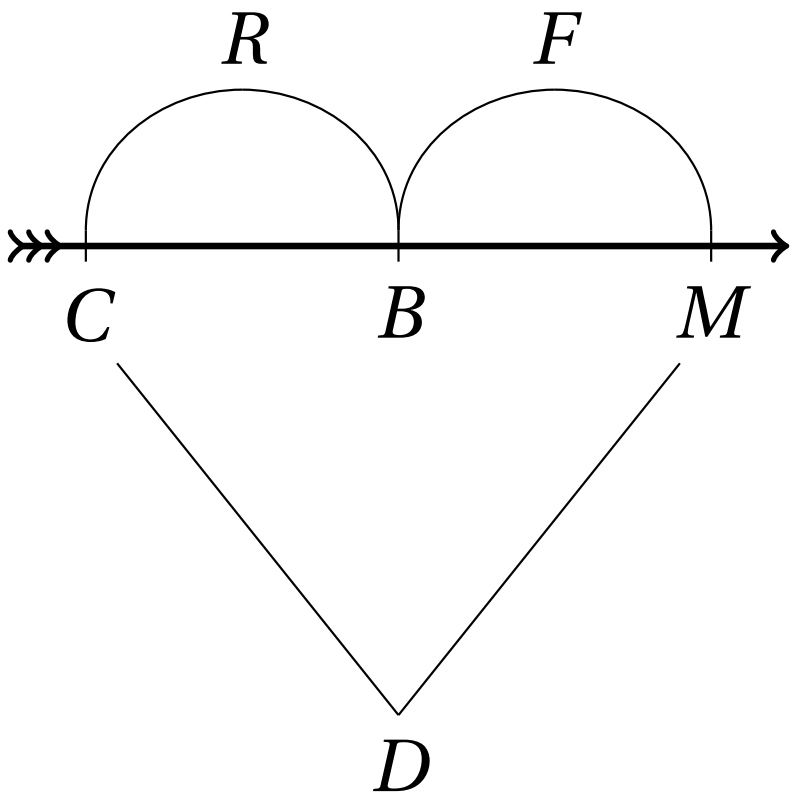
Proposition: These two heart figures are the only diagrams with their general shape that can display these variables while satisfying the balance sheet identity and the definitions of M, F, and B.

Sketch of Proof



If $F > 0$ then $B := R + C$, $M := D + C$, and $M \equiv F + B$ imply that $M = \max\{B, C, D, F, M, R\}$. So, $x_5 = M$.

R is the lone variable that does not combine with another to sum to M. This implies $x_1 = R$.

This leaves two cases; each case leads to one of our diagrams.

Thank You! Any Questions?