The Heart of Monetary Economics

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We currently use a Venn diagram to visualize \( M := C + D \) and \( B := C + R \).
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.
Depict $0 < C < B < M$ on a number line. Then $R$ measures the gap between $B$ and $C$, while $D$ measures the gap from $C$ to $M$. 
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 $D > R$. 

![Diagram showing the relationship between $M$, $B$, $D$, and $R$.]
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:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>$R$</td>
</tr>
<tr>
<td>Loans</td>
<td>$L$</td>
</tr>
<tr>
<td>Liquid Deposits</td>
<td>$D$</td>
</tr>
</tbody>
</table>
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 $D$. 
The simplified balance sheet identity implies

\[ L \equiv D - R. \]

Recall that \( D - R \) measures our missing gap.
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.
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 $E$.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities &amp; Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>$R$</td>
</tr>
<tr>
<td>Loans</td>
<td>$L$</td>
</tr>
<tr>
<td>Illiquid Debt</td>
<td>$I$</td>
</tr>
<tr>
<td>Liquid Deposits</td>
<td>$D$</td>
</tr>
<tr>
<td>Owners’ Equity</td>
<td>$E$</td>
</tr>
</tbody>
</table>
Balance Sheet Identity

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

\[ R + L \equiv I + D + E. \]

This implies our missing gap is \[ D - R \equiv L - I - E. \]
$L - I - E$ 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.
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 $B := C + R$. 
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

\[ R = 0.06 \]
\[ F = 3.07 \]
\[ M = 3.48 \]
\[ D = 3.13 \]

\[ C = 0.35 \quad B = 0.41 \]

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.
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).

```
0  F  D  M
```

```
R
```

```
C
```

```
B
```
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 $B$. 
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?

Diagram:

- Points: C, B, M, D, R, F
- Arrows: C→B→M, D→R→F