The Monetary Equation of Exchange

Economists use an equation made famous by Irving Fisher to show the relationship among money, price and real output. This equation is called the *equation of exchange*, and it typically takes the following form:

$$MV = PQ$$

M = the amount of money in circulation
V = the income velocity of money
P = the average price level
Q = real GDP or real value of all final goods and services

   This equation attempts to show the balance between "money," which is represented on the left side of the equation, and goods and services, which are represented on the right side. For a given level of income velocity, if the supply of money grows faster than the rate of real output (changes in Q), then there will be inflation in the economy. Classical economists assumed that the velocity of money was stable (constant) over time because institutional factors — such as how frequently people are paid — largely determine velocity.

Activity written by Robert Wedge, Massachusetts Council on Economic Education, Waltham, Mass.

Part A

1. Define (in your own words and in one or two sentences each) the four variables in the equation of exchange.

2. The product of velocity (V) and the money supply (M) equals PQ. How can PQ be defined?

3. Suppose velocity remains constant, while the money supply increases. Explain how this would affect nominal GDP.

4. During the past 30 years, the use of credit cards has increased, and banks and financial institutions increasingly use computers for transactions. Explain how these changes might affect velocity.

5. As the result of legislative and regulatory reform throughout the 1980s and 1990s, banks and other financial institutions began paying interest on a significant proportion of the checkable deposits in the M1 definition of the money supply. Explain how these changes might be expected to affect the velocity of M1.

Part B

The following tables give data on money supply, prices, real GDP and velocity for the U.S. economy for 14 recent years. Because of rounding, some totals may not come out exactly.

6. Complete the tables by filling in the blanks.

✳ Figure 36.1

M1 Chart

| Year	M1 (billions of $)	V	P Implicit Price Deflator for GDP	Q Real GDP (billions of $)	PQ Nominal GDP (billions of $)
1987	$750	6.36	0.780	$6,114	$4,768.90
1988	786	6.48	0.800	6,370	5,096.00
1989	792			6,592	5,489.00
1990	824	7.00	0.860	6,707	5,768.00
1991	896	6.71	0.90	6,677	6,009.30
1992	1,024	6.18	0.920	6,880	6,329.60
1993	1,129	5.88	0.940	7,063	6,639.20
1994	1,150	6.13	0.960		7,054.30
1995		6.57	0.980	7,544	7,393.10
1996	1,080		1.000	7,813	7,813.00
1997	1,073		1.020	8,160	8,323.20
1998	1,097	7.99	1.030	8,510	
1999	1,125		1.050	8,876	9,319.80
2000	1,088		1.0691	9,320	9,768.90

✳ Figure 36.2

M2 Chart

Year	M2 (billions of $; Dec. figures)	V	P Implicit Price Deflator for GDP	Q Real GDP (billions of $)	PQ Nominal GDP (billions of $)
1987	$2,830	1.68	0.78	$6,114	$4,769
1988	2,994	1.70	0.80	6,370	5,096
1989	3,158			6,592	5,489
1990	3,277	1.76	0.86	6,707	5,768
1991	3,377	1.78	0.90	6,677	6,009
1992	3,431	1.84	0.92	6,880	6,330
1993	3,484	1.91	0.94	7,063	6,639
1994	3,500	2.02	0.96	7,348	7,054
1995	3,642	2.03	0.98	7,544	
1996	3,815	2.05	1.00	7,813	7,813
1997	4,032	2.06	1.02		8,318
1998		2.00	1.03	8,510	8,790
1999	4,653		1.05	8,876	9,299
2000	4,945	2.01		9,319	9,963

7. What might one infer from the changes of the 1980s and 1990s about the classical assumption that institutional factors determine velocity?

8. Use the grid below and the M1 and M2 data to graph the income velocity from 1987 to 2000.
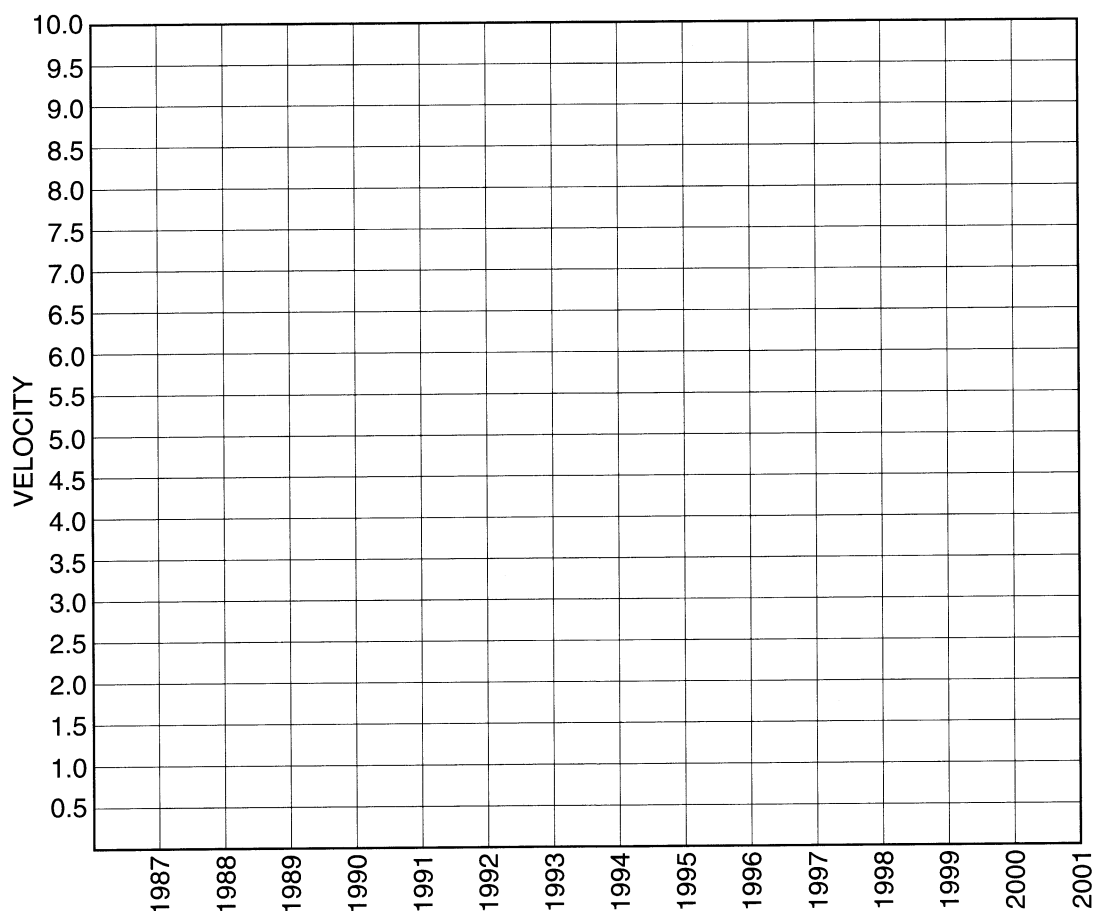
(A) What trends do you see?

(B) What is the difference in the value of M1 velocity and M2 velocity? Explain why they are different.

9. For a given money supply growth, a(n) (*increase / decrease*) in velocity will (*increase / decrease*) inflationary pressure. (Underline the correct word(s) in parentheses.)