

Keynesian Multiplier and the Money Multiplier¹

Instructional Primer²

The Keynesian Multiplier and the Money Multiplier as they relate to changes in GDP and the Money Supply, respectively, are rooted in the same mathematical operations – once you understand one of them, you should be able to more easily understand the other.

First consider the Keynesian multiplier as it relates to changes in GDP. We know that the multiplier itself is $\frac{1}{1-MPC}$ which equals $\frac{1}{MPS}$, and we know that $\Delta GDP = \Delta AAS \times \frac{1}{1-MPC}$. Recall that AAS is Autonomous Aggregate Spending and when we're talking about a ΔAAS in this type of example, we're simply talking about any economic, or economic policy change that represents a change in consumption (C), investment (I), or government spending (G) (recall that $GDP = C+I+G$), so a change in any of the right hand variables will certainly yield a change in the left hand variable.

So... if we have a \$100 billion change in government spending and an $MPC = .6$, we're going to have a change in GDP as follows (all of this will be in billions):

$$\begin{aligned}
 \Delta GDP &= \Delta AAS \times \frac{1}{1-MPC} && (1) \\
 &= \$100 \times \frac{1}{1-.6} \\
 &= \$100 \times \frac{1}{.4} \\
 &= \$100 \times 2.5 \\
 &= \$250
 \end{aligned}$$

The multiplier, $\frac{1}{1-MPC}$, is equal to 2.5 in this case, and were we to consider how this change in government spending plays out as it ripples through the economy we would expect the sum of the "ripples" to be equal to the change in government spending times the multiplier as follows:

Round	ΔGDP	Round	ΔGDP	Round	ΔGDP	Round	ΔGDP
1	100.00	7	4.67	13	0.22	19	0.01
2	60.00	8	2.80	14	0.13	20	0.01
3	36.00	9	1.68	15	0.08	Total	249.99
4	21.60	10	1.01	16	0.05		
5	12.96	11	0.60	17	0.03		
6	7.78	12	0.36	18	0.02		

¹ This primer is intended to present an abbreviated discussion of the included economic concepts and is not intended to be a full or complete representation of them or the underlying economic foundations from which they are built.

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\$249.99 is about as close as we can get to 250, so we're satisfied that the multiplier has been correctly applied in this case. Remember that the multiplier $\frac{1}{1-MPC}$ is a mathematical representation of the effect of this type of change after an infinite number of rounds or "ripples"; since our example only extends to 20 rounds we fall just short of 250.

Now let's think about this in terms of the Money Multiplier applied to Money and Banking. This is formed by the reserve requirement (rr), which can be thought of as 1-Loanable Option (LO). In modern banking we see that a bank can loan out 90% of its deposits, and we'll call this percentage the loanable option (LO). The reciprocal term would be the reserve requirement, or the amount of depositor's funds that the bank needs to keep on reserve, which then is equal to 10%. We can think of this as $1-LO = rr$, or $1-.90 = .10$, which is the common reserve requirement (rr) in modern banking. The Money Multiplier can then be thought of as $\frac{1}{1-LO}$ or $\frac{1}{rr}$.

If we want to see the effect this multiplier has on the expansion of the money supply we can look at it in much the same way we look at the Keynesian Multiplier. With a reserve requirement of 10% we calculate the multiplier as $\frac{1}{rr} = \frac{1}{.1} = 10$. This will be applied to a change in the level of deposits which we'll call ID (Initial Deposit) such that a change in the money supply (MS) is equal to a change in deposits (ID) times the multiplier or $\Delta MS = \Delta ID \times \frac{1}{rr}$. Assuming a \$100 initial deposit and a 10% reserve requirement we can calculate the effect on the money supply as follows:

$$\Delta MS = \Delta ID \times \frac{1}{rr} \tag{6}$$

$$\Delta MS = \$100 \times \frac{1}{.10} \tag{7}$$

$$\Delta MS = \$100 \times 10 \tag{8}$$

$$\Delta MS = \$1,000 \tag{9}$$

We can verify this just as we did the Keynesian Multiplier. We would expect that the Money Multiplier of $\frac{1}{rr}$, or $\frac{1}{.1} = 10$ this case, if allowed to "ripple" through the economy, would expand the money supply by 10 times the amount of an initial deposit as follows:

1	100.000	10	38.742	19	15.009	28	5.815	37	2.253
2	90.000	11	34.868	20	13.509	29	5.233	38	2.028
3	81.000	12	31.381	21	12.158	30	4.710	39	1.825
4	72.900	13	28.243	22	10.942	31	4.239	40	1.642
5	65.610	14	25.419	23	9.848	32	3.815	41	1.478
6	59.049	15	22.877	24	8.863	33	3.434	42	1.330
7	53.144	16	20.589	25	7.977	34	3.090	43	1.197
8	47.830	17	18.530	26	7.179	35	2.781	44	1.078
9	43.047	18	16.677	27	6.461	36	2.503	45	0.970

46	0.873	58	0.247	70	0.070	82	0.020	94	0.006
47	0.786	59	0.222	71	0.063	83	0.018	95	0.005
48	0.707	60	0.200	72	0.056	84	0.016	96	0.004
49	0.636	61	0.180	73	0.051	85	0.014	97	0.004
50	0.573	62	0.162	74	0.046	86	0.013	98	0.004
51	0.515	63	0.146	75	0.041	87	0.012	99	0.003
52	0.464	64	0.131	76	0.037	88	0.010	100	0.003
53	0.417	65	0.118	77	0.033	89	0.009		
54	0.376	66	0.106	78	0.030	90	0.008	Total	999.97
55	0.338	67	0.096	79	0.027	91	0.008		
56	0.304	68	0.086	80	0.024	92	0.007		
57	0.274	69	0.077	81	0.022	93	0.006		

While we were able to come close to the expected multiplier value after only 20 rounds, or “ripples” when we were using the Keynesian Multiplier built off of $MPC = .6$, it took 100 rounds for the Money Multiplier to do so; this is simply an issue of the Loanable Option (LO) being equal to .9 and is of no particular import otherwise.

We see the effect on the Money Supply (MS), but also need to think about what’s happened to the Monetary Base (MB) – the Monetary Base (MB) is the amount of money that banks needs to keep on hand in order to meet their reserve requirements, plus currency (in and circulation and held by banks).

Finally, we can see that the Money Multiplier is equal to $\frac{\text{Money Supply}}{\text{Monetary Base}}$. This is a relationship that’s important for you to recognize, but we won’t go into any detail regarding its formulation. In some respects this is pretty intuitive; suffice it to say that the Monetary Base, like the reserve requirement, is controlled by regulation through the Federal Reserve and has everything to do with the amount of money circulating through the economy. By now you should recognize that as the amount of money in the economy increases, regardless of the reason or cause, demand for goods and services increases.

What we’re really seeing through the Keynesian Multiplier and the Money Multiplier is how fiscal and monetary policies, respectively, might impact the economy given certain parameters.