On the Algebraic Calculation of the Fiscal Multiplier

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Abstract

Algebraic calculation of the fiscal multiplier ignores the concept of velocity of money. Here, we incorporate the concept of velocity of money in the algebraic derivation of the fiscal multiplier which results into a slightly different representation. Then, we empirically calculate the values of fiscal multipliers for 05 (five) OECD countries using our proposed algebraic representation and compare the results with the classical Keynesian values. Our results also point out why the theoretical values of the fiscal multipliers are higher than the empirical values.

1 Introduction

Multiplier in economics measures the change in any endogenous variable in response to the change in any exogenous variable. The concept of economic multiplier is almost as old as economics itself. The *Tableau économique* (Economic Table) of François Quesnay is often attrubuted to be the beginning point of multiplier theory[1]. However, the modern theory of economic multiplier tended to evolve during the height of great depression when Keynes and Henderson [3] argued in favour of enhanced government spending in order to boost up employment. But, the Keynesian thoughs of combatting great depression through government impetus faced opposition from the office of the chancellor of exchequer saying "whatever might be the political or social advantages, very little additional employment can, in fact, and as a general rule, be created by State borrowing and State expenditure"[4]. This view of the office of the exchequer during 1930s is famously known as the Treasury View[5] which suggests any increase in government spending necessarily crowds out an equal amount of private spending or investment and thus has no net impact on economic activity. In his 1929 budget speech, Winston Churchill explained, "The orthodox Treasury view is that when the Government borrow[s] in the money market it becomes a new competitor with industry and engrosses to itself resources which would

otherwise have been employed by private enterprise and in the process raises the rent of money to all who have need of it"[6]. However, the Keynesian macroeconomists rejected the treasury view and put forward the concept of fiscal multipliers in response. Richard Kahn in his famous paper "The Relation of Home Investment to Unemployment"[2] analysed the impact of enhanced government spending on unemployment in the presence of spare capacity, monetory accomodation and sticky prices. Kahn's idea was further advanced and extended by Jens Warming[7] who introduced the concept of consumption functions in the analysis of economic multiplier. The first formal presentation of the multiplier by Keynes was in a series of four articles published in The Times in March 1933, entitled "The Means to Prosperity", followed by an article in the New Statesman in April entitled "The Multiplier"[4]. Keynes further argued in favour of the multiplier effect in his famous book "The General Theory of Employment, Interest, and Money"[8]. The idea of economic multiplier since its modern inception back in 1930s received mixed response from the economic community as rightly mentioned by *The Economist*: "Economists are in fact deeply divided about how well, or indeed whether, such (fiscal) stimulus works". After its inception in 1930s the research on economic multiplier evolves around its empirical estimation and its effectiveness to downplay recession. For example, the performance of *American Recovery and Reinvestment Act of 2009* was analyzed using the theories fiscal multipliers. Developed in order to combat the great recession, the recovery act was indeed a stimulus package enacted by the 11th US congress to create new jobs and to sustain the existing ones. Numerous other researches have been conducted aiming to estimate a *credible size* of the fiscal multipliers which include but not limited to [10], [11], [12], [13] etcetera. The current literature on fiscal multiplier is somewhat policy oriented which helps government choose the best policy options available based upon sophisticated econometric techniques including impulse response analysis which attempts to capture the dynamic response of output to various government stimulus, tax cut and different combinations of the two. As the focus shifted to more practical side the theoretical derivation of the fiscal multiplier lacks proper attention. In the algebraic derivation of the fiscal multiplier it is assumed that one simple stimulus provided in the form of government spending triggers an infinite series of spending/consumption in the economy. The limiting value of the infinite geometric progression of spending/consmption thus created is treated as the value of fiscal multiplier. However, as we know from the concept of velocity of money, money will only change finite number of hands in a given year. So, if we do not overlook the concept of velocity of money, the infinite geometric progression used for the closed form algebraic calculation of the fiscal multiplier will only become a finite geometric series. The subsequent sections of this article is organized as

follows. Section: 2 discusses the conventional algebraic calculation of the fiscal multiplier. Section: 3 makes the proposed amendments to the derivation presented in Section: 2. Section: 4 describes the methodology used for empirical analysis. Section: 5 presents the data and finally Section: 6 makes some concluding remarks.

2 Conventional Algebraic Derivation of the Fiscal Multiplier

Let, ΔG be any exogenous change in government spending intended to work as fiscal stimuli. Then ΔG will be received as wages by the workers, rents by the land owners, salaries by the employees, social security benefits by the elderly and the unemployed etcetera. If the marginal tax rate is given by MTR then the increase in disposable income of the workers, land owners etcetera who receive ΔG is given by $(1 - MTR) \times \Delta G$. A part of this disposable income will be spent in consumption while the rest is saved. If the marginal propensity to consume is given by MPC then the amount spent in consumption (both local and foreign consumption) will be given by $MPC \times (1 - MTR) \times \Delta G$. If the marginal propensity to import is given by MPI then the amount of spending in locally produced goods and services is given by $MPC \times (1 - MTR) \times \Delta G - MPI \times \Delta G = (MPC \times (1 - MTR) - MPI) \times \Delta G$. Let, the quantity $(MPC \times (1 - MTR) - MPI)$ be given by c. So, the aggregate contribution resulting from these two rounds of consumption initiated by the fiscal stimuli ΔG is given by:

$$= \Delta G + \Delta G \times c$$

$$= (1 + c) \times \Delta G$$

The second round of consumption namely $c \times \Delta G$ will be received by the subsequent producers as income which triggers further consumption of $c \times c \times \Delta G$ or $c^2 \Delta G$. In the same manner, the subsequent consumption goes on and we get an infinite geometric series as the aggregate impact of an initial fiscal stimuli of ΔG:

$$\Delta Y = \Delta G \times (1 + c + c^2 + c^3 + ...)$$

$$\Delta Y = \Delta G \times \frac{1}{1 - c} \tag{1}$$

3 Amendment of the Algebraic Calculation of the Fiscal Multiplier

While deriving equation: 1 it is assumed that the initial fiscal stimuli trigger an infinite progression of subsequent consumptions. But, in true sense money paid as wages, rents, salaries etcetera can only change a finite number of hands in a given time. The number of times money changes hands in a given year is known as the velocity of money. Let, the velocity of money be denoted by v. Then equation: 1 turns out to be a finite series:

$$\Delta Y = \Delta G \times (1 + c + c^2 + c^3 + ... + c^{v-1})$$

$$\Delta Y = \Delta G \times \frac{1 - c^v}{1 - c} \tag{2}$$

4 Methodology

Marginal Propensity to Consume (MPC), Marginal Tax Rate (MTR) and Marginal Propensity to Import (MPI) are defined as the change in consumption, tax revenue and import in response to unit change in GDP. Hence, Marginal Propensity to Consume (MPC), Marginal Tax Rate (MTR) and Marginal Propensity to Import (MPI) for any year i for any country is calculated as follows:

$$MPC = \frac{C_i - C_{i-1}}{G_i - G_{i-1}}$$

$$MTR = \frac{T_i - T_{i-1}}{G_i - G_{i-1}}$$

$$MPI = \frac{I_i - I_{i-1}}{G_i - G_{i-1}}$$

Where C_i, G_i, T_i and I_i are consumption, GDP, total tax revenue and import at year i for a particular country.

On the other hand, the (income) velocity of money (v) is defined as the number of times money changes hands in a given year in order to purchase domestically produced goods and services. To calculate the velocity of money in a given year for any country, we invoke Quantity Theory of Money. If M, V, P and Q denotes total broad money stock, velocity of broad money, general price level and total amount of domestically produced goods and services respectively then the Quantity Theory of Money simply states that:

$$MV = PQ$$

$$V = \frac{P \times Q}{M} \tag{3}$$

We use, the above equation to calculate the velocity of M_2 money stock. Precisely, we divide the nominal GDP of a country by its M_2 money stock to calculate the velocity of money. Then we invoke equation: 1 to calculate conventional fiscal multipliers. In the next step, we use equation: 2 to calculate the modified version of the fiscal multipliers for different countries in varying time range.

5 Data

We collect annual data of Gross Domestic Savings as percentage of GDP, Tax Revenue as percentage of GDP, Import as percentage of GDP, Broad Money as percentage of GDP and GDP (LCU) of USA, UK, Australia, Canada and Japan from World Bank data warehouse which are publicly available through the URL: `data.worldbank.org/indicator`. Annual consumption is measured by deducting Gross Domestic Savings from GDP. The results are presented in Table:1, 2, 3, 4 and 5.

According to the definition, Marginal Propensity to Consume (MPC), Marginal Tax Rate (MTR), Marginal Propensity to Import (MPI) and $(MPC \times (1 - MTR) - MPI)$ can only posses values in the range $[0 - 1]$. Values beyond the permissible range indicates the influence of some other macroeconomic variables and/or change in policies, consumption patterns etcetera which are not considered in the analysis. When c is negative and v is a fraction then c^v is defined in the complex plane and of no real significance. These values are denoted by #NUM! in the data sheet.

Moreover, the velocity of M_2 stock is always positive and hence the value of c^v for any permissible value of c is a positive number. As c^v is deducted from the numerator in the modified algebraic calculation of the fiscal multiplier, the conventional, theoretical values of the fiscal multipliers are always greater than the modified calculation as can be seen from Table:1, 2, 3, 4 and 5.

6 Conclusion

In the classical derivation of fiscal multiplier it is mistakenly assumed that an initial impetus in the form of government spending will trigger an infinite progression of subsequent

consumption. But, here we argue that although it might trigger an infinite sequence of consumption in an arbitrarily stretched time horizon, money only change a finite number of hands during one year period. Hence, its contribution to GDP (if any) will be smaller than previously expected theoretical values. Our modification in the derivation of the fiscal multipllier also provides an explanation of why empirically measured values of the fiscal multipliers are smaller than its theoretical counter parts.

References

[1] Hegeland, H. 1954. The Multiplier Theory. C. W. K. Gleerup.

[2] Kahn, R.F. (June 1931). "The Relation of Home Investment to Unemployment". The Economic Journal. Wyley-Blackwell. 41 (162). doi:10.2307/2223697. JSTOR 2223697

[3] Keynes, J.M. and Henderson, H. (1929), Can Lloyd George Do It?, London: Hogarth Press.

[4] Snowdon, B., Vane, H.R. (2005). Modern macroeconomics: its origins, development and current state. Edward Elgar. p. 61. ISBN 978-1-84542-208-0.

[5] F.W. Leith-Ross to Sir Richard Hopkins and P.J. Grigg, 3 April 1929, quoted in G.C. Peden (2004), Keynes and His Critics, p. 80

[6] `https://en.wikipedia.org/wiki/Treasury_view#cite_note-2`

[7] Warming, J. (1932), International Difficulties Arising Out of the Financing of Public Works During a Depression, Economic Journal, June.

[8] Keynes, J.M. (1936), 'The General Theory of Employment, Interest, and Money' Palgrave Macmillan

[9] "Much ado about multipliers". The Economist. Sep 24, 2009. Retrieved 18 October 2011.

[10] Eckstein, Otto (1983). The DRI Model of the US Economy. New York: McGraw-Hill. ISBN 0-07-018972-2. See also Bodkin, Ronald G.; Eckstein, Otto (1985). "The DRI Model of the U. S. Economy". Southern Economic Journal. 51 (4): 1253Ũ1255. doi:10.2307/1058399. JSTOR 1058399.

[11] Ilzetzki, Ethan; Mendoza, Enrique G.; Végh, Carlos A. (2013). "How Big (Small?) are Fiscal Multipliers?". Journal of Monetary Economics. 60 (2): 239 to 254. doi:10.1016/j.jmoneco.2012.10.011.

[12] Acconcia, A.; Corsetti, G.; Simonelli, S. (2011). "Mafia and Public Spending: Evidence on the Fiscal Multiplier from a Quasi Experiment". CEPR Discussion Paper 8305. SSRN 1810270. See also http://voxeu.org/index.php?q=node/6314.

[13] IMF Global Prospects and Policies report 2012, page 43

Year	MPC	MTR	MPI	c = MPCx(1-MTR) -MPI	V	(1-cˆV)/(1-c)	1/(1-c)
1973	0.649394251	0.086652977	0.115968515	0.47715379	1.4269907	1.247220978	1.9126083
1974	0.890331404	0.158551997	0.301855732	0.44731185	1.4345156	1.238760607	1.809338595
1975	0.944656598	0.039615127	-0.033804908	0.941038815	1.4197641	1.401989514	16.96031037
1976	0.715897044	0.068375525	0.15062227	0.516324938	1.4321618	1.265261096	2.067503741
1977	0.733908929	0.194419381	0.15020349	0.441019319	1.4201784	1.229638718	1.788970591
1978	0.660395388	0.109193703	0.11014707	0.478137301	1.4419072	1.254928312	1.91621283
1979	0.714652795	0.15948645	0.146691246	0.453984112	1.4668791	1.256386356	1.831448538
1980	0.93149391	0.136524253	0.178649256	0.625673143	1.4413339	1.312467325	2.671462069
1981	0.675515352	0.159764214	0.068675366	0.498916807	1.4427295	1.263819214	1.995676594
1982	1.358501884	-0.014623046	-0.108747715	1.487115035	1.3659213	1.477120163	-2.052903172
1983	0.866855082	-0.083507877	0.086833864	0.852410445	1.3721342	1.333213468	6.775547243
1984	0.618666223	0.084832918	0.189958664	0.376224298	1.3542295	1.176532204	1.603140354
1985	0.918470074	0.131877755	0.039605804	0.757738498	1.3452366	1.285662749	4.127770998
1986	0.91838502	0.0610465	0.146408897	0.715911933	1.2988025	1.239492042	3.520035213
1987	0.833316194	0.236233405	0.199409416	0.437049655	1.3242238	1.182730551	1.776355605
1988	0.780556572	0.060824451	0.118403711	0.614675936	1.3373812	1.241546666	2.59521814
1989	0.75948344	0.131954457	0.091439871	0.567826344	1.3677852	1.24689219	2.313884675
1990	0.929859333	0.048959913	0.120215846	0.764117656	1.4079026	1.336678909	4.239401652
1991	0.980204059	0.059037099	-0.031791581	0.954127235	1.4321968	1.417873884	21.79942731
1992	0.82321276	0.042326478	0.121136956	0.667232108	1.5192525	1.379957271	3.005097616
1993	0.825721306	0.164310189	0.153736238	0.536310645	1.5886335	1.355095587	2.156616254
1994	0.710196564	0.156707446	0.217309208	0.381594266	1.6811471	1.296923023	1.617061333
1995	0.782632105	0.182265941	0.250899931	0.389084997	1.6495617	1.291926101	1.636888921
1996	0.724328142	0.181844862	0.140768696	0.451844094	1.6163036	1.319110837	1.824298506
1997	0.670408448	0.18952852	0.180616705	0.362730222	1.5904410	1.256427382	1.569194138
1998	0.810971949	0.214000537	0.124651256	0.512772261	1.5321292	1.314804556	2.052428298
1999	0.856500763	0.110857179	0.232600585	0.52895092	1.4870600	1.299473517	2.122921032
2000	0.916389679	0.238482428	0.358915654	0.338931189	1.4643690	1.20248652	1.51270183
2001	1.221425626	-0.222094972	-0.22915041	1.721848527	1.4012036	1.581075816	-1.38533219
2002	1.088524277	-0.495678821	0.094399618	1.53368309	1.3864001	1.516390776	-1.873771194
2003	0.91099922	-0.005724403	0.21562357	0.700590577	1.3924170	1.304945836	3.339908242
2004	0.795329718	0.117498279	0.335937602	0.365942243	1.4042355	1.192729059	1.577143389
2005	0.787983117	0.277944011	0.280177773	0.288790156	1.3860057	1.154654147	1.406054779
2006	0.813061134	0.222258522	0.284948607	0.347402761	1.3455455	1.162914737	1.532338692
2007	0.910957833	0.115992518	0.218584086	0.586709454	1.2585081	1.182794973	2.419605312
2008	1.751366068	-0.485791481	0.754697091	1.847467693	1.1827611	1.258799418	-1.179985984
2009	0.310768969	1.243984352	1.94045217	-2.016274935	1.0981777	#NUM!	0.331534764
2010	0.797923513	0.264454313	0.699763394	-0.112854196	1.1718572	#NUM!	0.898590313
2011	0.895590674	0.360351474	0.580564859	-0.007701605	1.1391733	#NUM!	0.992357257
2012	0.587788254	0.154703458	0.121566883	0.375288495	1.1305518	1.072149596	1.60073889
2013	0.541010178	0.333553375	0.008892855	0.351661552	1.1192439	1.063552311	1.542404286
2014	0.735587399	0.206256827	0.155610983	0.428256493	1.1120810	1.067915898	1.749036042
2015	0.745481565	0.17217449	-0.135908701	0.753037357	1.1182016	1.10053491	4.049195411
2016	1.063450724	-0.015572861	-0.105512336	1.18552403	1.1076399	1.118137719	-5.390137329

Table 1: Fiscal Multipliers for USA

Year	MPC	MTR	MPI	c = MPCx(1-MTR)-MPI	V	(1-cˆV)/(1-c)	1/(1-c)
1972							
1973	0.795593235	0.085009488	0.497749089	0.230211173	2.371360468	1.259155062	1.299057566
1974	1.206400793	0.4566691	0.862269277	-0.206794449	2.356007374	#NUM!	0.828641531
1975	0.988089166	0.264378171	0.07910678	0.64775318	2.724969452	1.969458246	2.838918457
1976	0.810144865	0.212827121	0.392798136	0.244925929	2.893319327	1.301763779	1.324373381
1977	0.691858373	0.204483759	0.273831335	0.276553237	3.078820047	1.355851851	1.382271719
1978	0.785100329	0.148971126	0.123582511	0.544560538	3.121166765	1.86628012	2.195681496
1979	0.833156169	0.205384376	0.281412275	0.380626634	3.283641433	1.546839944	1.614535036
1980	0.910638295	0.352949391	0.092859273	0.49636979	3.250524824	1.781834616	1.985583829
1981	0.943182492	0.317800523	0.109713175	0.533725427	2.874379106	1.791828265	2.144659087
1982	0.853528252	0.386956353	0.291126981	0.232123092	2.770860355	1.279530474	1.302292059
1983	0.851650122	0.119132934	0.352407259	0.397783286	2.753279632	1.529323241	1.660531794
1984	0.832970775	0.265191063	0.640112232	-0.028037863	2.652208479	#NUM!	0.972726819
1985	0.742973135	0.287334208	0.181636954	0.347854584	2.619849647	1.436976021	1.533400336
1986	1.123050165	0.161975224	0.076725272	0.864418592	2.300478249	2.100489945	7.375642516
1987	0.731670842	0.110986989	0.234801757	0.415663141	1.350251267	1.188293136	1.711341643
1988	0.820790186	0.216152659	0.239896401	0.403477804	1.298696915	1.160617703	1.676383557
1989	0.744463389	0.206305501	0.332512414	0.258364082	1.196986152	1.081525396	1.348370509
1990	0.925486001	0.401578487	0.118204255	0.435626478	1.177021739	1.105586603	1.771876178
1991	1.161567042	0.381135231	-0.188399777	0.907252697	1.218512584	1.205853804	10.78198467
1992	1.296979875	0.091059329	0.40289888	0.775978878	1.77108694	1.615303111	4.463864789
1993	0.913528546	-0.01574626	0.528268727	0.399644477	1.781166398	1.34051283	1.665679688
1994	0.799179045	0.392130692	0.418050464	0.067745948	1.742093094	1.06281173	1.072668977
1995	0.320253132	0.203721317	0.218924866	0.036085876	1.644381478	1.033034576	1.037436816
1996	0.795170559	0.210769582	0.357129049	0.270443744	1.532633176	1.185972146	1.370696217
1997	0.934399045	0.34531706	0.113381091	0.498354022	1.282332943	1.177333445	1.993437692
1998	0.956738728	0.561349693	0.161895024	0.257778713	1.107102092	1.046936798	1.347307086
1999	1.159844734	0.393440991	0.406777974	0.296736298	1.103555097	1.049881051	1.421941722
2000	0.814591756	0.357160831	0.530859434	-0.007207947	1.051154877	#NUM!	0.992843636
2001	1.156782385	0.147674917	0.374129433	0.611825209	0.999024445	0.999244368	2.576159049
2002	0.973530017	0.072783092	0.16578371	0.736889783	0.99662802	0.997115143	3.800688584
2003	0.84773075	0.174604793	0.150739419	0.548973478	0.960495958	0.970820145	2.217164518
2004	0.9743723	0.379689479	0.28739403	0.317019359	0.917729513	0.95399049	1.464170343
2005	0.810131726	0.311331018	0.47606003	0.081852561	0.853033579	0.960364004	1.089149691
2006	0.752014952	0.291788342	0.626484445	-0.09389869	0.789186026	#NUM!	0.914161439
2007	0.753794612	0.293340626	-0.082428552	0.615104581	0.715492398	0.763041688	2.598108342
2008	1.503036043	0.537908752	1.292685644	-0.598145843	0.621552289	#NUM!	0.62572512
2009	0.186298945	1.091612122	0.777852834	-0.794920075	0.604976916	#NUM!	0.557127871
2010	0.61631672	0.606384458	1.068989492	-0.826397652	0.600911685	#NUM!	0.54752589
2011	0.588982513	0.453637764	0.67259219	-0.350794387	0.650647416	#NUM!	0.74030512
2012	0.941111975	-0.016167295	0.207045033	0.749282176	0.665485161	0.697052961	3.988547704
2013	0.715872804	0.249060583	0.309836772	0.227740334	0.677823062	0.819900127	1.294901241
2014	0.690100346	0.186112557	0.005632603	0.556031403	0.728982989	0.784061896	2.252411557
2015	0.793149492	0.336487663	-0.120464441	0.646728914	0.734978607	0.775852955	2.830687367
2016	0.824617159	0.366749806	0.615281465	-0.093092489	0.702741331	#NUM!	0.91483567

Table 2: Fiscal Multipliers for UK

Year	MPC	MTR	MPI	c = MPCx(1-MTR)-MPI	V	(1-c^V)/(1-c)	1/(1-c)
1991	4.002397698	0.461796675	0.215313299	1.938790449	1.321105095	1.489205037	-1.065200441
1992	1.181617559	0.105033997	0.963020398	0.094487145	1.271399248	1.049342457	1.104346553
1993	0.661548148	-0.028402532	0.936094302	-0.255756511	1.297445736	#NUM!	0.796332721
1994	0.414686296	0.034566471	0.73184258	-0.331490526	1.314797545	#NUM!	0.751038014
1995	0.419880403	0.176303654	0.604647038	-0.258793084	1.316915046	#NUM!	0.794411737
1996	0.681568627	0.314937611	0.390409982	0.07650705	1.308541939	1.045361556	1.082845299
1997	0.683269694	0.2726594	0.920284136	-0.423314346	1.322306094	#NUM!	0.702585485
1998	0.825891654	0.175126524	0.88791064	-0.20665452	1.338751244	#NUM!	0.828737624
1999	0.567070175	0.151888745	0.411459031	0.069479566	1.361662209	1.04620482	1.074667427
2000	0.537518892	0.165158694	0.417333851	0.031409123	1.401579348	1.024348526	1.032427647
2001	1.034072131	-0.053088525	-0.28692459	1.375894085	0.644378736	0.60732769	-2.660323851
2002	1.035364782	-0.053629436	0.200441294	0.890449518	0.654649133	0.6676835	9.128211771
2003	0.713717694	0.103544025	-0.194124509	0.833941	0.684650551	0.704023323	6.021956058
2004	0.517356517	0.151614459	0.30990688	0.129010909	0.691170329	0.86932906	1.148120005
2005	0.617740245	0.125952242	0.332580082	0.207354394	0.671023605	0.822643466	1.26159786
2006	0.791178388	0.142380186	0.276965642	0.40156462	0.628224823	0.729021662	1.671024195
2007	0.796188134	0.130415002	0.207918844	0.484434413	0.889817411	0.921887167	1.939617433
2008	0.778891814	-0.063760376	0.437442531	0.391111717	0.813346576	0.876984634	1.642337402

Table 3: Fiscal Multipliers for Canada

Year	MPC	MTR	MPI	c = MPCx(1-MTR)-MPI	V	FM = (1-c^V)/(1-c)	1/(1-c)
1973	0.693652604	0.100912201	0.029646522	0.594008071	2.007394282	1.597348869	2.46310315
1974	0.629062916	0.230089337	0.235981753	0.248340494	2.2280356	1.270669142	1.330389614
1975	0.989434032	0.29970599	0.231440647	0.461454078	2.181897924	1.513341455	1.856851867
1976	0.795725646	0.228462558	0.05417495	0.559757179	2.274057657	1.664395797	2.271473725
1977	0.775025317	0.220845992	0.228869674	0.374994409	2.478140505	1.459222308	1.599985687
1978	0.923216103	0.190320027	0.139432319	0.60807727	2.449351777	1.797059262	2.551523358
1979	0.613391877	0.149213319	0.212440542	0.309425098	2.480474512	1.369160086	1.448068844
1980	0.665803436	0.252716018	0.20048004	0.297064202	2.466093282	1.351305927	1.422605028
1981	0.790911657	0.294778436	0.230539091	0.327228864	2.540091547	1.399331045	1.486389571
1982	0.738759855	0.224206265	0.174131685	0.398993582	2.651061587	1.5182437	1.663875743
1983	1.285450517	0.234121123	-0.00014771	0.984647109	2.52174574	2.492366521	65.13431415
1984	0.549122445	0.155729919	0.101796407	0.361811243	2.545884397	1.449174689	1.566934531
1985	0.64201019	0.373737842	0.40041686	0.001649828	2.377605179	1.001652311	1.001652554
1986	0.865689382	0.232527734	0.253129952	0.411262639	2.403235044	1.497772192	1.698550265
1987	0.797994045	0.298895157	0.069816643	0.489660846	2.274460005	1.573273878	1.959481243
1988	0.558523009	0.224841247	0.13290825	0.30003575	2.187287312	1.325996203	1.428644391
1989	0.601887916	0.19062457	0.19461119	0.292542101	1.894413523	1.27577822	1.413511675
1990	0.776979803	0.203098344	0.179929558	0.439246934	1.846175644	1.392829747	1.783316152
1991	1.892314946	0.185101367	-0.172748703	1.714793565	1.872509385	2.441454661	-1.399005319
1992	2.141772152	-0.68	0.283417722	3.314759494	1.77706418	3.201871281	-0.432010324
1993	0.608963639	0.066606145	0.476802523	0.091600396	1.76408399	1.084603218	1.100837116
1994	0.539331367	0.205595781	0.30942165	0.119025463	1.685266259	1.103683871	1.135106587
1995	0.737797051	0.401040763	0.419115351	0.022795007	1.649092391	1.021322544	1.023326741
1996	0.708403972	0.326319932	0.120337854	0.356899782	1.589924535	1.252761166	1.554967595
1997	0.596778853	0.319911888	0.095045501	0.310816703	1.559375255	1.216413816	1.450992797
1998	0.816161678	0.195817838	0.471316223	0.18502644	1.523098803	1.133108684	1.227033672
1999	0.953475902	0.26485617	0.268735806	0.432206121	1.437016177	1.233618955	1.7612025
2000	0.701227532	0.321423352	0.337108481	0.138728147	1.476972225	1.098287898	1.161073587
2001	0.85202815	0.510989136	0.30348236	0.113168661	1.419898153	1.076495346	1.127610129
2002	0.623340179	0.049860707	0.013339569	0.578920428	1.419126888	1.281491302	2.374848048
2003	0.853614651	0.371918175	0.279704402	0.256435446	1.336426852	1.12668873	1.344873145
2004	0.687431822	0.2472687	0.02827798	0.48917347	1.288738848	1.178633478	1.957611714
2005	0.702438785	0.320068044	0.364051229	0.113559348	1.272185187	1.057244212	1.128107108
2006	0.618580822	0.216359407	0.303548617	0.181196425	1.194882272	1.062660082	1.221294131
2007	0.73177823	0.187428712	0.235602621	0.359019358	1.101380645	1.055250038	1.560109517
2008	0.716663723	0.261391734	0.330658336	0.198675413	1.019897158	1.007845608	1.247933754
2009	0.513704354	-0.092763277	0.240707322	0.320649932	1.057595841	1.029929281	1.471995143
2010	1.298722319	-0.265811609	-0.393800427	2.037738216	0.991429203	0.98805626	-0.963634166
2011	0.540359562	0.181561577	0.163444502	0.278806526	0.999651565	0.999827916	1.386590472
2012	0.722805488	0.360833606	0.433973917	0.028019061	0.985603271	0.998477548	1.02882676
2013	1.093819104	0.552963702	0.018202902	0.470773941	0.946180726	0.963190851	1.889551701
2014	0.809432255	0.212346916	0.269121401	0.368430411	0.919680106	0.951287718	1.583356795
2015	1.750312159	0.229865772	0.234235992	1.113739311	0.881689073	0.875994171	-8.792034937

Table 4: Fiscal Multipliers for Australia

Year	MPC	MTR	MPI	c = MPCx(1-MTR)-MPI	V	(1-c^V)/(1-c)	1/(1-c)
1973	0.593571536	0.17178877	0.173867005	0.317735607	0.818683636	0.892387853	1.465707444
1974	0.710014282	0.092011707	0.355419512	0.289265144	0.856502227	0.920708976	1.406994453
1975	1.022436958	-0.090836363	-0.02316429	1.138475703	0.809094806	0.798947188	-7.221483492
1976	0.664649666	0.0732118	0.123303316	0.492686151	0.786650638	0.841673343	1.971166375
1977	0.671639165	0.094373251	0.001035173	0.60721922	0.770810733	0.812743497	2.545949425
1978	0.635849842	0.101581684	-0.107736564	0.678995708	0.741885819	0.77771198	3.115223144
1979	0.78478273	0.181898607	0.476734718	0.165297127	0.723425941	0.872238709	1.198031099
1980	0.703217932	0.174838987	0.384353988	0.195914034	0.715248931	0.856079901	1.24364812
1981	0.612747738	0.171754257	0.053405956	0.45409975	0.686358147	0.766296677	1.831836495
1982	0.918604059	0.106026339	0.10727713	0.713930703	0.660116474	0.697160413	3.495656514
1983	0.791642758	0.085364607	-0.239924854	0.963989338	0.635866214	0.640104928	27.76955372
1984	0.53441434	0.156546011	0.150021859	0.300732047	0.625106648	0.75528566	1.430066967
1985	0.561962348	0.162409266	-0.082699226	0.553393682	0.612545502	0.680733789	2.239108495
1986	0.574963383	0.086380772	-0.621491344	1.146788946	0.589035555	0.572396633	-6.812502084
1987	0.648124644	0.30442095	0.056401343	0.394420581	0.562862564	0.673151612	1.651311074
1988	0.475399508	0.16577358	0.135406175	0.261184656	0.554457306	0.710554467	1.35351818
1989	0.619602559	0.119052753	0.250212017	0.295625152	0.534856251	0.679890865	1.41969862
1990	0.637233152	0.198916584	0.183941056	0.326535854	0.538726795	0.672353141	1.484860041
1991	0.575149896	0.1601743	-0.096337163	0.579362827	0.543303691	0.610077205	2.377345761
1992	1.120978838	-0.479263579	-0.1807148	1.838937967	0.53929762	0.463598187	-1.191983244
1993	36.93409864	-0.650510204	-14.7002551	75.66036179	0.516718273	0.111849615	-0.013393988
1994	1.774296829	-0.299758272	0.201674484	2.104482497	0.502207142	0.410208244	-0.905401401
1995	0.82560887	0.057251908	0.353671392	0.424669794	0.493141038	0.598775626	1.738132275
1996	0.628343334	0.052641498	0.607333474	-0.012067074	0.48736501	#NUM!	0.988076804
1997	0.873374442	0.003730985	0.376541581	0.493574314	0.467905515	0.555558532	1.974623382
1998	0.120531154	0.59861785	0.755729699	-0.707350645	0.448354732	#NUM!	0.585702769
1999	-0.351290562	0.286561866	0.283145494	-0.533769577	0.429337625	#NUM!	0.651988418
2000	0.666184684	0.544937768	0.679779422	-0.376623933	0.429430501	#NUM!	0.726414801
2001	-1.429478519	0.776844096	-0.436368549	0.117371978	0.515236674	0.757291742	1.132980118
2002	-0.164885735	0.712315496	0.023380065	-0.070815136	0.503670991	#NUM!	0.93386801
2003	1.500256191	1.346199829	-2.336806149	1.817417711	0.50039481	0.426262319	-1.223364733
2004	0.479163297	0.495246824	1.041709346	-0.79985015	0.502671476	#NUM!	0.555601809
2005	0.920723622	1.391393572	2.678916461	-3.039281769	0.503225154	#NUM!	0.247568765
2006	0.921948378	0.822053952	3.87647894	-3.712421869	0.509627435	#NUM!	0.21220511
2007	0.502277217	-0.344410939	1.406987626	-0.731720641	0.511051236	#NUM!	0.577460346
2008	0.08167692	0.65848257	-0.496240602	0.524134693	0.496907329	0.577013423	2.101434977
2009	0.260406155	0.177554165	0.95462074	-0.740450782	0.457665427	#NUM!	0.574563791
2010	0.373992205	0.286946346	0.86024012	-0.593563612	0.459788549	#NUM!	0.627524369
2011	0.114472243	-0.212410848	-0.903458761	1.04224615	0.438880868	0.433790359	-23.67079615
2012	1.415504269	0.547693522	1.024121509	-0.383879758	0.432605357	#NUM!	0.722606133
2013	0.931957559	0.512058308	1.471600311	-1.016859364	0.424914399	#NUM!	0.495820392
2014	0.51427984	0.635994916	1.033952002	-0.846751525	0.421316892	#NUM!	0.541491363
2015	0.158080155	0.097085556	-0.386867884	0.529600739	0.423602284	0.5018113	2.125853682
2016	-0.027074303	-0.140882353	-2.20379257	2.172903975	0.412572175	0.321747807	-0.852584714

Table 5: Fiscal Multipliers for Japan