

# ESTIMATING THE LINK BETWEEN QUANTITATIVE EASING 3 AND BUSINESS INVESTMENT

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*The BRC Academy Journal of Business* 5, no. 1 (2015): 1-17.

<http://dx.doi.org/10.15239/j.brcacadjb.2015.04.01.ja01>

## **WEB APPENDIX**

<http://dx.doi.org/10.15239/j.brcacadjb.2015.04.01.wa01>

## Appendix 1

Boskin (1978) estimated that consumption (C) declines by 1.06% if interest rate (r) changes by 1%:

$$\partial \ln C / \partial r = -1.06 \quad (17)$$

Recall that e in (14) represents the elasticity of demand for financial investment with respect to interest rate:  $e = \partial FT / \partial r \cdot r / FT$ . Since all personal savings channel to financial investment, e is better known in economics literature as the elasticity of savings with respect to interest rate:

$$e = \partial \ln S / \partial \ln r \quad (18)$$

where

$$= \frac{\partial S / S}{\partial r / r}$$

Since household savings (S) equal disposable income minus consumption, we can write

$$\partial S = -\partial C$$

$$= -\frac{\partial C / S}{\partial r / r}$$

$$\partial r / r$$

$$= -\frac{\partial C}{\partial r} \cdot \frac{r}{S}$$

$$\partial r \cdot S$$

Dividing both the numerator and denominator by C:

$$= -\frac{\partial C / C}{\partial r} \cdot \frac{r}{S}$$

$$\partial r \cdot S$$

$$= -\frac{\partial \ln C}{\partial r} \frac{r C}{S}$$

Thus,

$$e = -\partial \ln C / \partial r \quad r C / S \quad (19a)$$

For the 2013 data, if we use the average AAA and Treasury bond yields as a proxy of the interest rate (3.5%) and we assume an average marginal tax rate of 30%, then we find an after-tax yield of 2.43%.

Consumption and household savings in 2013 are \$11,537 Billion and \$618 Billion, respectively (Table 1).

These values can be substituted into (19a) to estimate the value of e:

$$e = -(-1.06) \times .0243 (11537B/618B) = 0.48 \quad (19b)$$

Table 1

	Q3 2013	Q3 2014
Households and institutions savings (\$ Billion)	618.00	657.90
Personal saving (\$ Billion)	618.00	657.90
Gross domestic investment (\$ Billion)	3352.30	3481.70
Personal Consumption Expenditures (PCEC) (\$ Billion)	11537.70	11973.00
New Security Issues, U.S. Corporations (\$ Billion)	374.09	340.88
New Issues, Treasury (\$ Billion)	640.00	553.00
Personal current taxes (\$ Billion)	1657.80	1739.90
Personal income (\$ Billion)	14226.20	14801.20
Interest Rates (Average Yield)		
Treasuries, July	2.44	2.40
Treasuries, August	2.42	2.40
Treasuries, September	2.43	2.40
Average Treasury (Q3)	2.43	2.40
Moody's Seasoned Corporate (AAA), July	4.34	4.16
Moody's Seasoned Corporate (AAA), August	4.54	4.08
Moody's Seasoned Corporate (AAA), September	4.64	4.11
Average Corp (AAA) (Q3)	4.51	4.12
Average of Treasury and Corporate (Q3)	3.47	3.26

Average After-tax Yield (assume t=30%)	2.43	2.28
e	0.48	0.44
E	-1.00	-1.00
Investment Realization Ratio	0.87	0.90

Table 2

E	Investment Realization Ratio	Estimated IB Increase for 2013 (\$ Billion)
-0.10	0.40	410.91
-0.20	0.57	585.82
-0.30	0.67	682.69
-0.40	0.73	744.22
-0.50	0.77	786.76
-0.60	0.80	817.93
-0.70	0.83	841.75
-0.80	0.84	860.55
-0.90	0.86	875.76
-1.00	0.87	888.33