

## **Explaining GDP Growth: A Long Term Horse Race, 1955-2013**

**Sorin A. Tuluca**

**Burton Zwick**

### **Abstract**

From 1955 through 1980, both the slope of the yield curve and the level of stock returns provided considerable information about future output growth. Using data for growth, the yield curve and returns in a long term horse race from 1955 through 2013, this study shows that the explanatory power of the yield curve virtually collapsed after 1980. The explanatory power of stock returns also weakened in the 1990s but recovered considerably thereafter. Although the returns-output growth relation is not completely stable, our results suggest this relation is much more robust than the yield curve-output growth relation. The returns-output growth relation is much less sensitive to changes in cyclical, inflation, and the resulting response of monetary policy.

**Key Words:** real stock returns, yield curve, real GDP growth, unemployment, short term interest rates, long term interest rates

**JEL Classification:** E01, E17, E43

### **Introduction**

To improve both investment performance and the conduct of monetary policy, investors and economists have analyzed the relation of financial market variables to real variables such as output growth, real consumer spending growth, and industrial production. As well as the growth of money and credit, analysts have focused on the slope of the yield curve, or the spread between long term rates and short term rates. To a lesser degree, they have looked at stock prices, including returns on stocks.

The slope of the yield curve is often viewed as a forecast of the future direction of rates. A positively sloped curve suggests that rates are likely to rise. Consistent with this view is the notion that the slope of the yield curve indicates the degree of stimulus or restraint that the Federal Reserve is injecting into the economy. Under normal conditions, notably before 2008, the Fed exerted direct control over the federal funds rates. Efforts by the Fed to push the funds rate below long term rates indicate the Fed's desire to promote faster growth and inflation over time.

In line with the view that long term rates and forward rates tend to predict the future direction of rates, Fama (1984) reports that forward rates provide information about the direction of short term interest rates. Campbell and Shiller (1987) and Mishkin (1988) provide further evidence of the ability of the yield curve to predict future rates. Since nominal rates reflect both real returns and expected inflation, this link suggests that forward rates and, by extension, the slope of the yield curve may contain information about either future inflation or real growth. With regard to inflation, Mishkin (1990) suggests that the yield curve explains not only real rates of interest but also inflationary expectation 1-12 months ahead and Fama (1990) indicates that the yield curve provides information about inflation three to five years into the future. With regard to real activity, Fama suggests that the yield spread explains real growth 2-3 years ahead. Harvey (1989) reports that the yield spread explains about 30% of the fluctuation in output growth

between 1955 and 1980. Estrella and Mishkin (1997) and Hamilton and Kim (2002) also indicate that the yield curve provides information about the pattern of real growth. Estrella and Mishkin (1996), Dueker (1997) and Dotsey (1998) indicate that the yield curve helps to forecast recessions.

Harvey (1989) found that the forecasting power of the yield curve for 1955-1980 deteriorated considerably thereafter. Hardouvelis (1988) and Estrella and Hardouvelis (1991), using data through 1988, also note a deterioration in the predictive performance of the term structure beginning in 1985. Estrella and Mishkin (1996), Dueker (1997) and Dotsey (1998) also report deterioration into the 1990s.

A positive relation between stock returns and future output could result from expectations about future earnings, in which case the effect is from output growth to returns. Alternatively, it could result from a wealth effect on consumer spending (Poterba, 2000), in which case the causal direction runs from returns to output. Either way, the focus of Fama (1981) on the real return-output relation spurred considerable research on the relation between returns and output growth. In several papers, Fama observed and emphasized that stock returns, responding to expected earnings and dividends, were positively correlated with future output growth. Barro (1990) and Schwert (1990) provided further evidence to support the relation between real returns and output growth.

In his empirical work, Fama used annual average data and showed that returns were positively correlated with next year's output growth. He also noted that an often observed negative correlation between current growth and current inflation was spurious, proxying for an inverse relation between current inflation and future output growth. This notion is referred to this as the proxy hypothesis. Benderly and Zwick (1985) confirmed the proxy effect but explained it in terms of a real balance effect of inflation on output growth rather than an effect of future output on current inflation. In another study linking returns and output growth, Levine and Zerkos (1998) noted a positive effect of stock prices and returns on output and production through the improved liquidity of banks and the financial system.

Harvey reported that returns explained only about 5% of the fluctuation of output growth between 1955 and 1980, compared with the much larger 30% explained by the yield curve. He suggested that part of the reason for the low correlation between returns and output growth was the tendency of stock prices and returns to reflect not only expected growth in earnings and dividends but also the perceived risk of equity investments.

Noting the deterioration in the return-output relationship into the 1980s and 1990s across many industrialized countries, Binswanger (2000, 2004) argued that speculative bubbles dominated fundamentals in the determination of equity prices.

This paper compares the explanatory power of real stock returns and the yield curve on output growth in a long term horse race over the interval from 1955 to 2013. This interval extends the results reported in the extant literature and allows for a finer analysis. This interval includes dramatic changes in the economic and financial environment. As an example, from 1953 to 1980, inflation rose from about 2% to 10%, but then declined back to 2% between 1980 and 2000. Other factors also differ before and after 1980 as discussed more fully in the paper. The

main contribution of this paper is to show that the difference in the economic environment is a powerful factor in the ability of the yield spread and stock returns to explain the output growth.

The paper continues with Section 2 that outlines the model and the general framework to be estimated, describes the measurement of variables, and identifies the time interval for estimation. Section 3 reports the results. Section 4 provides an interpretation of the results. Section 5 is a summary and conclusion.

### **I. The Model and the Data**

The model for estimation in this paper is most easily viewed as a single equation for the growth rate of real GDP. Real GDP growth (%RGDP) is related to the yield spread (SPREAD) and/or stock returns (RRSP) from a previous period, which can be written as

$$\%RGDP(t) = \alpha + \beta_1 \text{ SPREAD}(t-1) + \beta_2 \text{ RRSP}(t-1) + \epsilon(t)$$

The rationale for the yield spread (the long term rate minus the short term rate) to explain future output growth runs along three general lines. The first is the expectations theory of the term structure which holds that long-term interest rates are equal to the geometric mean of current and expected future short term rates. If investors fear interest rate or price risk more than reinvestment risk, long term rates should have a term premium relative to short term rates so that, on average, long term rates will be higher than short term rates (a positively sloping yield curve). If and when investors expect short term rates to fall, such as during an anticipated recession or economic slowdown, the yield curve will flatten or even invert. When investors expect short term rates to rise because of an expected economic expansion, the yield curve will steepen.

The second rationale for the yield curve to explain future output growth is the notion that the slope of the yield curve indicates the degree of stimulus or restraint that the Federal Reserve is injecting into the economy. Under normal conditions, notably before 2008, the Fed exerted direct control over the federal funds rates. Efforts by the Fed to push the funds rate below long term rates indicate the Fed's desire to promote faster growth and inflation over time. When the Fed wants to slow the economy, presumably to control inflation, they will raise short term rates relative to long term rates.

An entirely different notion proposed by Harvey (1988) to explain the predictive power of the yield curve is that individuals prefer stable consumption rather than high consumption during periods of rising income and low consumption when income is falling. When consumers expect a recession, they will sell short-term financial instruments and purchase one-year discount bonds to obtain income during the recession year. As a result the term structure flattens or inverts.

Stock returns can explain future output growth for either of two reasons. The first, as emphasized by Fama (1981), is that stock prices and returns reflect expectations about real future earnings and dividends which should in turn reflect real economic activity. In this case, stock prices reflect rather than cause future output growth and their role as an economic indicator is reflected in their permanent inclusion as a component in the composite index of leading indicators. The second reason for stock prices and returns to explain future output growth is the effect of stock prices on household wealth (see Poterba (2000)). For retirement, education,

emergencies and other reasons, households save to increase their wealth to some desired target level over time. An increase in stock prices allows higher consumer spending by reducing the amount of saving necessary to achieve the desired wealth target. An increase in stock prices and wealth stimulates consumer spending and increases future output growth.

Since stock prices and output fluctuate almost randomly during short intervals, this analysis, following Fama (1981), uses annual data. The variables are measured as follows:

Real GDP growth (%RGDP) is measured using annual average data. Our GDP data series was obtained from the Federal Reserve Bank of St. Louis data base. We compute %RGDP as follows:

$$\%RGDP(t) = \ln\left(\frac{RGDP(t)}{RGDP(t-1)}\right)$$

The yield spread (SPREAD) is computed using the 10-year treasury (T10) constant maturity bond rate as the long term interest rate. The short term rate was measured by the federal funds rate (FFR). Following Harvey we compute SPREAD as follows:

$$SPREAD(t) = \ln\left(\frac{(1+T10(t))}{(1+FFR(t))}\right)$$

Results using either the 3-month treasury bill rate or the 1-year constant maturity treasury rate as the short term rate were similar to those using the federal funds rate. All interest rates were obtained from the St. Louis Federal Reserve data base and were measured using December data.

Real stock returns (RRSP) were measured using the S&P 500 stock price index (SP). The nominal stock price measure was deflated by the consumer price index. Returns were measured using only changes of real stock prices (that is, the capital gain or loss component of total return), using December average data. Total returns including dividends yielded similar results as those using only the capital gains component. Nominal returns also yielded similar results to those using real returns. S&P prices were obtained from Robert Shiller's data base, so that:

$$RRSP = \ln\left(\frac{SP(t)}{SP(t-1)}\right)$$

The time interval for estimation runs from 1955 through 2013. For estimates regarding stock returns, we present estimates for 1955-1977 and 1978-2013 because of the performance of stock returns as discussed in the next section. For estimates regarding the yield spread, we present estimates for 1955-1980 and 1981-2013 because of the dramatic change at that time from a generally stimulative monetary policy that contributed to an increase in inflation from about 2% in the 1950s to 10% in 1980 to a more anti-inflationary monetary policy thereafter that contributed to sharply falling inflation between 1980 and 2000. For the equation using stock returns and yield spread, we present estimates for 1955-77, 1978-2013 and in addition for 1955-1980 and 1981-2013 to allow a direct comparison of the effects of adding the yield spread into the equation that includes stock returns.

## II. Results

Parameter estimates regressing the growth rate of real GDP growth against real stock return, for 1955-2013, 1955-1977, 1955-1980 and 1978-2013 are presented in the upper part of **Table 1** with “t-statistics” below the estimates of the regression coefficients and “p-values” below the “t-statistics.”

**Table I. Real GDP growth explained by Real Stock Returns or Yield Spread**

Period	$\alpha$	$\beta_1$	$\beta_2$	Adj.R <sup>2</sup>	DW
1955-2013	0.03	0.08		0.4	1.28
t -stat	12.6	6.4			
p-value	0.0	0.0			
1975-1977	0.03	0.1		0.61	1.37
t -stat	10.8	6			
p-value	0.0	0.0			
1978-2013	0.02	0.06		0.27	1.22
t -stat	8.7	3.8			
p-value	0.0	0.0			
1955-2013	0.03		0.36	0.06	1.49
t -stat	8.8		2.2		
p-value	0.0		0.04		
1955-1980	0.03		1.19	0.45	1.48
t -stat	8.2		4.6		
p-value	0.0		0.0		
1981-2013	0.03		0.09	-0.02	1.35
t -stat	6.2		0.47		
p-value	0.0		0.64		

These results show a positive and statistically significant effect of returns on real GDP growth for 1955-2013, but this result for 1955-2013 contains quite different results for the two sub-periods. For the 1955-77 interval, the adj. R<sup>2</sup> is 60%, higher than the 40% adj. R<sup>2</sup> for the total period. This result contrasts sharply with Harvey (1989) who reported that, for 1955-80, returns explained only about 5% of the variation in output growth. Harvey used nominal rather than real returns, but as mentioned above our results were unaffected by the choice between nominal and real returns. The only possible explanation for these divergent results could be the quarterly frequency used by Harvey that captured more volatility in the stock returns. The positive results are more consistent with those of Fama (1981), who emphasized that returns reflect real growth one year later, which can be interpreted as returns one year earlier explaining output growth in the current period. Schwert (1990) confirms this result for a century long interval, 1889-1988, and Barro (1990) confirms it across a range of industrialized countries besides the US.

From an  $\text{adj.R}^2$  of 60% for 1955-77, the  $\text{adj.R}^2$  falls to 28% for 1977-2013. Even this much lower  $\text{adj.R}^2$  is somewhat misleading because subintervals within the 1977-2013 interval show still lower or even statistically insignificant returns. This is consistent with Binswanger (2003,2004) who reports a sharp drop in the predictive power of returns across several industrialized countries during the period after 1980. We discuss the 1977-2013 period in more detail below.

Parameter estimates regressing the growth rate of real GDP growth against the yield spread for 1955-2013, 1955-1980 and 1981-2013 appear in **Table I** immediately below the results for returns discussed above.

For the total interval from 1955 to 2013, the yield spread explains 6% of the variation in real GDP growth. For 1955-1980, the yield spread explains 45% of the variation, but its explanatory power fell virtually to zero for 1981-2013. The positive result for 1955-80 is broadly consistent with the results reported by Harvey (1989) who reports that the yield spread explains about 30% of the variation in growth between 1955 and 1980. Harvey then notes deterioration in the relation after 1980, and this deterioration is reconfirmed by Hardouvelis (1988) and Estrella and Hardouvelis (1991).

Parameter estimates of regressing the growth rate of real GDP growth against the returns and the yield spread for 1955-2013, 1955-1977, 1955-1980, 1978-2013 and 1981-2013 are presented in **Table II**.

In line with the results for returns and the yield spread separately, the combined results show positive performance for the 1955-77 and 1955-80 intervals and less positive predictive power for the 1978-2013 and 1981-2013 periods. For 1955-1980, and also for 1955-2013 presumably because of the effects from the 1955-80 sub-period, the variables in combination explain more than either variable by itself. The  $\text{adj.R}^2$  of .59 for 1955-80 compares with an  $\text{adj.R}^2$  of .48 for returns alone and .45 for the yield spread by itself. In the 1955-80 interval, the coefficients of both return and the yield spread are statistically significant at the .05 level. These 1955-80 results are generally consistent with those of Hu (1993), who showed statistically significant effects of both returns and the yield spread in a combined regression using data from 1958-92.

In the next section, with information presented in two additional tables, we focus on three questions? Why does the explanatory power of the yield spread disappear completely after 1980? Though the explanatory power of returns also weakens after 1980, indeed after 1977, why do returns perform considerably better than the yield spread for the post 1980 interval? Why do returns and spread in combination explain more than either returns or the spread alone for the 1955-80 interval?

**Table II. Real GDP growth explained by Real Stock Returns and Yield Spread**

Period	A	$\beta_1$	$\beta_2$	Adj.R <sup>2</sup>	DW
1955-2013	0.03	0.08	0.25	0.43	1.25
t -stat	10.6	6.2	1.9		
p-value	0	0	0.06		
1955-1977	0.03	0.08	0.41	0.62	1.22
t -stat	8.8	3.6	1.2		
p-value	0	0	0.25		
1978-2013	0.02	0.07	0.25	0.31	1.31
t -stat	6.8	4	1.6		
p-value	0	0	0.11		
1955-1980	0.03	0.06	0.73	0.59	1.32
t -stat	9.8	3	2.7		
p-value	0	0.01	0.01		
1981-2013	0.02	0.08	0.24	0.42	1.48
t -stat	6.1	5	1.6		
p-value	0	0	0.12		

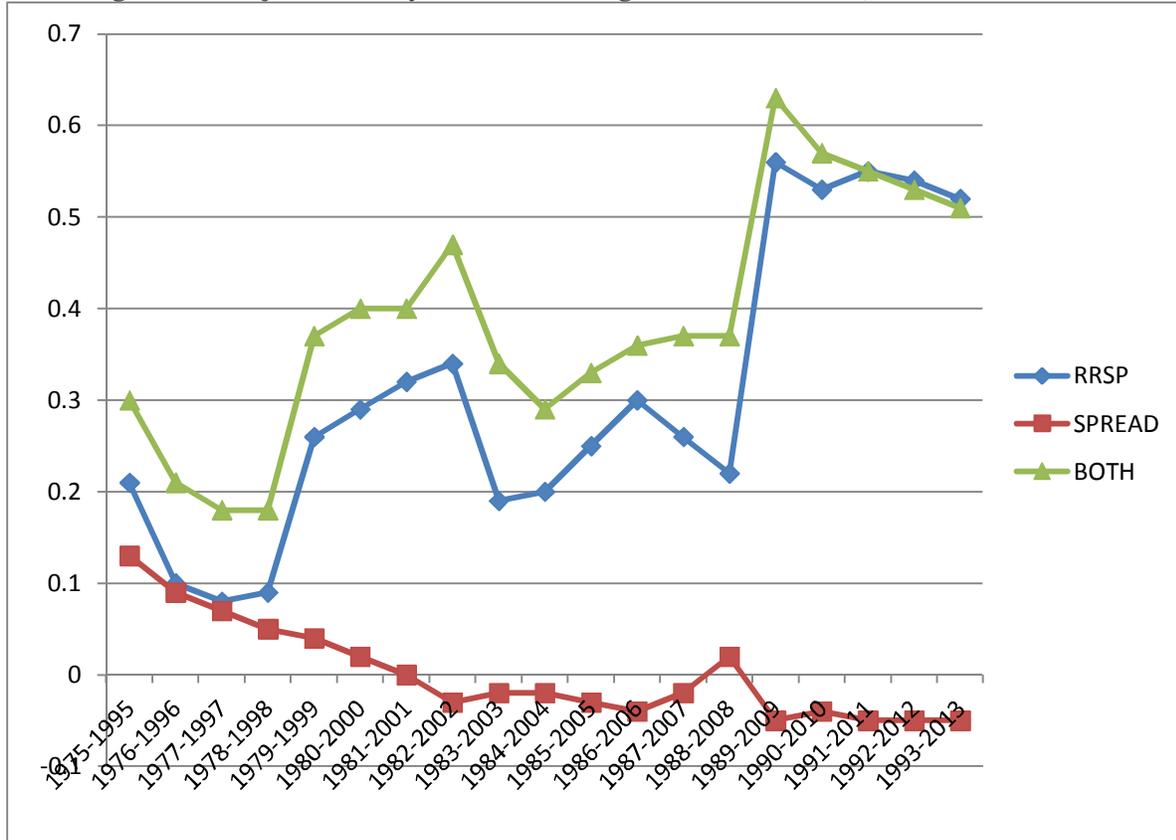
### III. Further Interpretation of the Empirical Results

To answer the three questions just posed, **Figure 1** first presents three series of adj. R<sup>2</sup> for 20-year window regressions, from 1975-95 to 1993-2013. We selected 1975 as the start of this exercise since up to that time both SPREAD and RRSP show reasonable explanatory power. The first, labeled RRSP, we obtain by regressing real GDP growth (%RGDP) against real returns (RRSP), the second labeled SPREAD is obtained by regressing %RGDP against the yield spread (SPREAD), and the third labeled BOTH results from regressing %RGDP against both RRSP and SPREAD. As mentioned above, for 1955-1980, the adj.R<sup>2</sup> for SPREAD was .45, and it drops sharply thereafter. In the first window regression for 1975-95, the adj. R<sup>2</sup> had already fallen to .13 and by 1980-2000, the adj.R<sup>2</sup> is .02. For all later regressions, the adj.R<sup>2</sup> is virtually zero or negative.

To understand this deterioration, it is useful to look at the nine post-1955 recessions, which are shown in **Table III**. In this table, we show the severity of each recession as measured by the increase in the unemployment rate during the recession. We also show the increase in the federal funds rate in the preceding twelve months before the cyclical peak and the onset of recession.

From both the unemployment and interest rate perspective, the differences between 1955- 1982 and 1983-2013 are striking. As well as the sharp increase in inflation from 2% to 10% mentioned in the Introduction, the 1955-82 interval experienced six recessions (five if the 1980 and 1981-82 are combined) with an average increase in the unemployment rate (combining 1980 and 1981-81) of 3.7 percentage points. Between 1983 and 2007, as well as the decline in inflation from 10% back to 2%, the economy experienced only two recessions with an average increase in the unemployment rate of 1.8 percentage points, or roughly half the average increase in the earlier recessions.

Figure 1. Adj R<sup>2</sup> for 20 year window regression on RRSP, SPREAD and BOTH



The different pattern of the funds rate is even more remarkable. In the six recessions between 1955-1982, here treating the 1980 and 1981-82 as separate recessions, the funds rate rose an average of 460 basis points, or almost five percentage points, in the twelve months leading up to these recessions. This clearly results from an aggressive attempt by the Federal Reserve to control inflation. The Fed was willing to risk recession if necessary to bring inflation under control.

During the two mild recessions of 1990-1991 and 2001, the federal funds rate actually fell, by 109 basis points leading up to the 1990-1991 recession and 54 basis points ahead of the 2001 recession. It seems clear from this general discussion of the dramatically different environment in terms of output growth, inflation, and financial market conditions that the early power of the yield curve to predict output growth would weaken or completely disappear after 1982.

The post 1982 interval finally included a severe recession in 2008. The unemployment rate rose 5.6 percentage points, from 4.4% in 2007 to 10% in early 2009, the most severe recession of the post War interval. The contrast with the second most severe downturn, in 1980-82 when unemployment rose 5.2 percentage points, highlights the difference between the 1955-82 and 1983-2013 intervals. The 1980-82 recession was engineered by the Federal Reserve, with successive funds rate increases of 760 basis points and 1001 basis points increases back to back, in a dramatic attempt to quell inflationary expectations. The 2013 recession could not have been

more different. Inflation was scarcely a problem. The funds actually fell 31 basis points in the twelve months before the cyclical peak. Again, there is no reason in this environment to expect the yield curve to provide the type of predictive information about future output growth that it provided up to 1982.

**Table III. Unemployment and Federal Funds Rate During Recessions**

Recession date	Unemployment rate			Date	Δ Pre_Post
	Pre-recession low	Date	Post-recession high		
August 1957-April 1958	3.7	Mar-57	7.5	Jul-58	3.8
April 1960-February 1961	4.8	Feb-60	7.1	May-61	2.3
Dec 1969-November 1970	3.4	Apr-69	6.1	Dec-70	2.7
Nov 1973-March 1975	4.6	Oct-73	9	May-75	4.4
January 1980-July 1980	5.6	May-79			
July 1891-Nov 1982	(recessions too close, no low)		10.8	Dec-82	5.2
July 1990-March 1991	5.2	Jun-90	6.8	Mar-91	1.6
March 2001-Nov 2001	3.9	Dec-00	6	Dec-01	2.1
December 2007-June 2009	4.4	May-07	10	Oct-09	5.6
	Federal Funds Rate				
	Peak FFR	Year ( t)	FFR Year (t-1)	Δ FFR	
August 1957-April 1958	3.24	Jul-57	2.75	0.49	
April 1960-February 1961	3.92	Apr-60	2.96	1.06	
Dec 1969-November 1970	8.57	Dec-69	6.02	2.55	
Nov 1973-March 1975	10.78	Sep-73	4.87	5.91	
January 1980-July 1980	17.61	Apr-80	10.01	7.60	
July 1891-Nov 1982	19.04	Jul-81	9.03	10.01	
July 1990-March 1991	8.15	Jul-90	9.24	-1.09	
March 2001-Nov 2001	5.31	Mar-01	5.85	-0.54	
December 2007-June 2009	4.94	Sep-07	5.25	-0.31	

The situation with stock returns is different. As shown in the window regressions, the  $\text{adj.R}^2$  drops to .21 in 1975-95 from considerably higher numbers earlier in the 1955-1985 interval and then falls to .08 in 1977-1997 and .09 in 1978-78. However, the  $\text{adj.R}^2$  then recovers to the .20-.35 range during all but one interval up to 1988-2008. Then in 1989-2009 it soars to .56 from .22 in 1988-2008 and remains higher than .50 through 1993-2013. The deterioration from 1977-1995 to 1978-98 results from very high returns in 1996, 1997 and 1998 accompanied by only slightly higher than average growth in 1997, 1998 and 1999. The very high returns were associated with continued disinflation, declining unemployment, and rapid productivity growth, and a simple relation linking real growth and real returns cannot capture these positive effects. Even more salient is the sharp increase in the  $\text{adj.R}^2$  in 1979-2009 in response to the very sharp drop in output in 2009 (the worst post WWII recession) following the 40% drop in returns in 2008.

In general, the returns-growth relation is subject to sharp fluctuations as factors other than output growth affect returns, but unlike the spread-growth relation, there is no fundamental change to completely invalidate this linkage. Indeed, the 2008-2009 experience of a sharp output decline in 2009 following the 40% drop in stock prices in 2008 is a sharp confirmation of the link between output growth and returns.

Turning to the link of spreads and returns in combination to output growth, the 1955-80 results show positive and statistically significant effects of both returns and the yield spread. The  $\text{adj.R}^2$  of .59 is considerably larger than the  $\text{adj.R}^2$  of .48 using returns alone and .45 using spreads alone. The independent effects of each variable suggest that each captures factors not captured by the other. In particular, the spread variable reflects monetary policy actions and their likely effect on output growth. The return effect reflects the combination of a wealth effect (stock prices affecting future growth) and expected real earnings and dividends (expectations of future growth affecting current stock prices).

The spread effect is entirely dependent on particular economic conditions and the response of the Federal Reserve to these conditions. The output growth effect of returns based on the wealth effect and earnings expectations is likely to persist in a wider range of environments than the effect of the spread variable.

#### **IV. Summary and Conclusion**

The U.S. economy experienced enormous changes during the post WWII period. In the early 1950s, the economy was still recovering from the Great Depression and many economists and investors were concerned that, without sizable cold war defense spending, the economy might fall back into depression. The stock market was quite depressed, with dividend yields higher than bond yields, and interest rates and inflation were in low single digits.

A general determination to lower unemployment and a Federal Reserve focus on interest rates and financial conditions rather than the money supply caused the Federal Reserve to pursue a highly stimulative monetary policy that helped push inflation from about 2% in the 1950s to 10% in 1980. In the late 1970s, the Federal Reserve reversed course and raised interest rates dramatically to curb inflation. Their restraint triggered a pair of recessions in between 1980 and

1982. The sharp rise in unemployment, and continued monetary restraint throughout the 1980s and 1990s brought inflation back down to 2% by 2000.

During the early post WWII period, the slope of the yield curve, along with the general level of interest rates, was widely used as an indicator of monetary policy. As the Federal Reserve was repeatedly forced to raise short term rates massively to control inflation, the resulting recessions confirmed a strong link between the slope of the yield curve and future output growth. This relation collapsed in the period after 1982, as the economy shifted from accelerating inflation in the 1955-82 interval to disinflation from 1982 through 2000 and beyond. Estimates (1955-2013) in this paper of a virtual collapse in the yield curve as an explanatory variable of future output growth result largely from changes in the pattern of inflation and real growth and the Federal Reserve response to these changes. The yield curve-growth relation appears totally dependent on a particular set of economic and financial conditions, and unless these conditions recur, the yield curve is unlikely to provide useful information about future output growth.

To a lesser degree, economists and investors in the early post WWII period focused on a link between stock returns and future output growth. This relation also performed well through the late 1970s and weakened after 1980. However, following a deterioration in the relation in the late 1990s, the relation recovered considerably in the period after 2008. Although the return-output relation is not completely stable, this recovery shows that the return-output relation is much less dependent than the yield curve on particular economic and financial conditions. Either through wealth effects on consumer spending, or as an indicator of future earnings and dividends, returns are likely to provide useful information about future output growth irrespective of the changes in economic and financial conditions that invalidated the predictive power of the yield curve.

## References

- Barro, R. 1990. "The Stock Market and Investment," *Review of Financial Studies*, 3 115–131.
- Benderly, J. and B. Zwick, 1985, "Inflation, Real Balances, Output and Real Stock Returns" *American Economic Review*, December, 1115-1123.
- Binswanger, M., 2000. "Stock market booms and real economic activity: Is this time different?," *International Review of Economics and Finance*, 9, 387–415.
- Binswanger, M., 2004, Stock returns and real activity in the G-7 countries: Did the relationship change during the 1980s?," *The Quarterly Review of Economics and Finance* 44, 237–252
- Campbell, J. and R. Shiller, 1987, "Cointegration and Tests of Present Value Models," *Journal of Political Economy* 95, 1062-1088.
- Dotsey, M., 1998, "The Predictive Content of the Interest Rate Term Spread for Future Economic Growth," Federal Reserve Bank of Richmond *Economic Quarterly* Volume 84/3, Summer, 31-52.
- Dueker, M. J., 1997, "Strengthening the Case for the Yield Curve as a Predictor of U.S. Recessions," Federal Reserve Bank of St. Louis *Review*, 79, (March/April), 41–51.
- Estrella, A and F. Mishkin. 1997, "The predictive power of the term structure of interest rates in Europe and the United States: Implications for the European Central Bank," *European Economic Review* 41, 1375-1401.
- Estrella, A, and G. Hardouvelis, 1991, "The Term Structure as a Predictor of Real Economic Activity," *Journal of Finance* 46 (June), 555–76.

- Estrella, A. and F. Mishkin, 1998, “Predicting U.S. Recessions: Financial Variables as Leading Indicators,” *Review of Economics and Statistics*, 80 (February), 45–61.
- Estrella, A. and F. Mishkin, 1996, “The Yield Curve as a Predictor of U.S. Recessions,” Federal Reserve Bank of New York, *Current Issues in Economics and Finance* 2, 7, June . 1-6.
- Fama, E., 1981. Stock Returns, Real Activity, Inflation, and Money. *American Economic Review*, 71, 545–565.
- Fama, E., 1984. “The Information in the Term Structure,” *Journal of Financial Economics* 13, 509-528.
- Fama, E., 1990, “Term-Structure Forecasts of Interest Rates, Inflation, and Real Returns,” *Journal of Monetary Economics* 25, 59-76.
- Hamilton, James D. and Kim, Dong H., 2002, “A Re-Examination of the Predictability of the Yield Spread for Real Economic Activity,” *Journal of Money, Credit, and Banking*, May, 34(2), 340-60.
- Hardouvelis, G., 1988, “The Predictive Power of the Term Structure during Recent Monetary Regimes,” *The Journal of Finance* 43, 339-356.
- Harvey, C, 1989, “Forecasts of Growth from the Stock and Bond Markets,” *Financial Analysts Journal*, September/October, 38, 38-45.
- Hu, Z., 1993, “The Yield Curve and Real Activity,” IMF Staff Papers, 40, 4, December, 781-806.
- Levine R. and Zervos S., 1998. “Stock Markets, Banks and Economic Growth,” *American Economic Review* 88, 3, 537-558.
- Mishkin, F., 1988, “The Information in the Term Structure: Some Further Results,” *Journal of Applied Econometrics* 3, 307-314.
- Mishkin, F., 1990, “What Does the Term Structure Tell Us About Future Inflation,” *Journal of Monetary Economics* 25, 77-95.
- Poterba, J., 2000, “Stock Market Wealth and Consumption,” *Journal of Economic Perspectives* 12, 2, Spring, 99-228.
- William Schwert G, 1990, “Stock Returns and Real Activity: A Century of Evidence,” *The Journal of Finance*, 1990, 44, 4, 1237-1257.

## Authors

### **Sorin A. Tuluca\***

Professor of Finance, Department of Economics, Finance and International Business, Fairleigh Dickinson University-Madison Campus, Madison NJ 07940, [tuluca@fdu.edu](mailto:tuluca@fdu.edu)

### **Burton Zwick**

Senior Lecturer of Finance, Department of Economics, Finance and International Business, Fairleigh Dickinson University-Madison Campus, Madison NJ 07940

\*corresponding author