Tech Stock Returns and Empirical Analysis of CAPM

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We empirically tested a modified version of Capital Asset Pricing Model (CAPM) using the past twenty one years of 30 largest companies of NASDQ traded at the NASDAQ exchange. We used quarterly data from 1998Q1 until 2018 Q4. The results show that Risk Premium, Real GDP growth, VIX and SMB are good predictors of overall stock returns. In general, our results indicate that risk premium, real GDP growth, and Treasury Yield are consistent predictors of stock returns – with positive coefficient. On the other hand SMB and the change in VIX are negatively significant and weak predictor of stock returns.

Keywords: Nasdaq, tech stock, VIX, stock returns, CAPM

INTRODUCTION

Capital Asset Pricing Model (CAPM) is one of the recent models that was developed by Sharpe (1964) and Lintner (1965) and is widely used since then. CAPM is widely used by analysts, investors and corporate managers, the model focuses on the risk of a firm relative to the market return as the basis for the measure of risk and calculates beta (risk measure) in terms of portfolio. Recently, other studies including Fama and French (1993) suggested that CAPM alone may not the best model to predict stock returns and introduced other variables such as the size, market/book value ratio and momentum may increase the accuracy of stock return prediction. Other multi-variable models represent steps forward to increase accuracy of stock return predictions, however, the basic CAPM is still the most widely used method for estimating stock returns.

Bakshi and Wu (2010) study the rise and fall of Nasdaq market using time-varying returns and option prices on the Nasdaq 100 tracking stocks. Their study period is March 1999 to March 2001 and they find three key variations in the study period: first return volatility increased together with the rising Nasdaq index level, however they tend to move in the opposite directions. Second, the estimate of stock returns become negative at the end of 1999 and reverted to back to highly positive values after the collapse of the Nasdaq market. Third, the market price of jump risk increased with the rising Nasdaq valuation and this increase coincide with open interest in the option market. Another article by Skrinjaric and Tihana (2018) used rolling regression CAPM on the Zagreb Stock Exchange with the assumption of changing parameter

over time. Using weekly data from January 2012 until April 2018 his result indicate trading strategies could lead to better portfolio risk and return compared to Zagreb Stock Exchange index (CROBEX). These findings indicate that CAPM needs further investigation both in the emerging and developed markets are still important. Our study focuses on further investigation of the US 30 large companies traded at National Association of Securities Dealers Automated Quotation (NASDAQ) exchange by employing a modified version of the Capital Asset Pricing Model using the twenty one year from Jan. 1998 – Dec. 2018 quarterly data.

The capital asset pricing model (CAPM) is a model that describes the relationship between expected return and risk of investing in stocks. The CAPM is widely used in applications, such as estimating the cost of capital for firms and assessing the performance of managed portfolio.

The CAPM builds on the model of portfolio choice developed by Harry Markowitz (1959). In this model, an investor selects a portfolio at time t-1 that produces a stochastic return at time t. The model assumes investors are risk averse and, when choosing among portfolios, they care only about the mean and variance of their one-period investment return. As a result, investors choose "mean-variance-efficient" portfolios, in the sense that the portfolios: 1) minimize the variance of portfolio return, given expected return, and 2) maximize expected return, given variance. Thus, the Markowitz approach is often called a "mean-variance model." The portfolio model provides an algebraic condition on asset weights in mean-variance efficient portfolios. The CAPM turns this algebraic statement into a testable prediction about the relation between risk and expected return by identifying a portfolio that must be efficient if asset prices are to clear the market of all assets.

RESEARCH PROBLEM

Capital Asset Pricing Model is one of widely used method by stock analysts, investors, and others to predict stock returns. The objective of this study is to empirically test a modified version of CAPM using 30 largest firms traded at NASDAQ exchange. The study is expected to improve the prediction of stock returns as it includes other macro level variables such as interest rate ten year Treasury Bill yield, GDP growth, and VIX – measure of S&P 500 volatility. Furthermore, the modified version of CAPM including Fama and French's three factor model (HML and SML in addition to Market risk premium) will also be used as explanatory variables. We will use as a market return the S&P 500 stock returns. One of the weaknesses of the CAPM is that it cannot be tested in real time or the future. The model can be tested after the fact that is after it happened – that is its drawback. That is Capital Asset Pricing Model is an ex ante model, which means that all of the variables represent before-the-fact, expected values. Our modified version of CAPM is expected to improve the prediction of stock returns as it includes additional macro level variables.

LITERATURE REVIEWS

Several scholars have tested CAMP and they have derived at different results. Choudhary and Choudhary (2010) examines the Capital Asset Price Model on the Indian stock market by using stocks from 278 companies of BSE 500 listing from January 1996 to December 2009, they found that the findings in the study do not correlate with the theory's basic hypothesis that higher risk (beta) is associated with a higher level of return. It was later concluded that the inclusion of the square of the beta coefficient to test for nonlinearity in the relationship between returns and betas indicates that the findings are according to the hypothesis. This tells us that beta is not sufficient to determine the expected returns on securities/portfolios.

Similarly, another study by Saji Gopinath, Chandrasekhar Krishnamurti (2001) that uses ten days of data from NASDAQ Stocks of April 1996 and composed of 958 stocks which are divided into 6 portfolios. The study confirms the positive relationship between a number of transactions and stock price volatility for Nasdaq stock using a high-frequency transaction database. The result of the study showed that the relationship between volatility and the volume of stocks is determined by the type of transaction

and not by the trade size and that the stock volume is also determined by the type of information, which are firm-specific information and Market wide information. Firm-specific is associated with small firms, while large firms are associated with both market wide and firm-specific information. Because of the influence of inside information on firm-specific information, there is a higher spread caused by adverse selection, but large firms are not exposed to adverse selection.

Vintila and Paunescu (2015) used a period from 4th January 2010 to 26th December 2014, covering 48 months to analyze the quality of stocks for technological companies under NASDAQ using the CAMP and determining if the stocks are undervalued (If the expected return is lower than the actual return then the asset is undervalued), or overvalued (If the expected return is higher than the Market Value). They used the OLS and GMM method to estimate beta and they arrived at a different result. After analyzing all fifteen stocks, large firms have sub-unitary beta because they are large/matured firms, so they are not expected to have large growth out of the blue moon so the risks are lower, thus the return from these firms won't be higher in Reverse, Smaller companies tend to have bigger growth thus causing riskier growth opportunities and as a result, they generate a higher return.

Shahi and Shaffer (2017) studied whether the distribution of asset return is constant over time by using daily returns for three series over 1950-2015. First, the stocks were split into different time intervals. After that, several tests like Sample Test, and Variance ratio test were carried out and the outcomes were that the variance of return changes significantly. The changes vary for the different indexes, for example, the variance changes throughout S&P 500 index. It changes in all but one instant in CRSP value-weighted index, and lastly, it changes in all but three cases for the CRSP equal-weighted index. In conclusion, the result rejected the CAPM assumption that the distribution of return is constant.

Furthermore, other scholars (Chong et al. 2017) uses daily returns (including dividend distributions) and delisting returns of stocks listed on NYSE, AMEX, and NASDAQ over the sample period of July 1963 to December 2013 to examine the performance of risk-adjusted momentum strategies by selecting past winners and losers and considering the risk-adjusted returns. The study uses CAPM and the Fama–French regressions to evaluate the profitability of the momentum strategies. After analyzing returns of the market mutual portfolio, they found that the beta for such a portfolio is low because they have higher Sharpe ratios than the portfolios constructed by simply ranking the past returns. The result explains that Market and firm-specific information cannot explain momentum profit.

Over the past few decades many researchers, finance professionals, and people in academia have debated on the ideas and power of the CAPM equation. Zabarankin, Pavlikov, and Urysev (2013) the purpose of their research was to define the drawdown beta and to prove the beta is a correct source to use to measure how well an asset is performing in the marketplace. Another primary aspect they wanted to bring out was to lay the groundwork of what we today now call portfolio theory. They used the CDaR method to conduct their research to represent various assets compared to the CAPM. They used data from 72 hedge fund indexes with 3 different examples with varying betas. The research concluded that the CDaR beta can be negative while the standard beta can be positive. This identifies another position on the "hedging" prowess of certain instruments.

Another set of minds in the arena of academia Nugraha, & Susanti (2019) discussed how the CAPM can be used by investors, portfolio managers, etc. to choose which stocks to invest in. They used companies that are in the coal mining sector and collected data from 2012-2016 and amassed 22 companies however only information from 16 were actively used as samples. The criteria they laid out was such that these needed to be "efficient stocks...where the individual rate of return (Ri) is greater than the expected rate of return [E (Ri)]." Out of the data they collected they concluded that the beta and expected rate of return for the stocks are inversely related. The relationship is such that when the beta value is high, the rate of return (return) will be low, and the reverse idea fallows when the beta is low the rate of return is high. In the sample 11 were in the "efficient" and 5 were inefficient. They stated, "the investment decision that must be taken when the stock is in an efficient condition is to buy the shares, but if the conditions are not efficient then the action taken is the opposite, namely, to sell the shares."

Researchers also have tried to understand the market and how humans operate with in it. Bush, Mehdian, and Perry (2010) conducted a study using daily stock returns from the NASDAQ composite

index and its eight composite indexes to determine investor reaction to newly presented information and its potential either positive or negative effect. Three primary hypotheses were researched: Efficient Market Hypothesis, Overreaction Hypothesis, and the Uncertain Information Hypothesis. They concluded that within certain markets that with the arrival of unfavorable and favorable information investors will set certain price points for stocks to mitigate their risk. The authors also stated "…that investor reaction is not universal across industry sectors, and in fact varies significantly by sector…" with this it proves as to why this is an area to be further investigated.

The intellectual battle with the CAPM formula and the theories surrounding it have travelled across the world and landed in many countries. Bilgin and Basti (2014) wrote on the validity of the formula with specific regard to the Istanbul Stock Exchange (ISE). Their samples years are between January 2003 and December 2011. They used two different methods to test the formula: the unconditional is developed by Fama and Macbeth (1973). For this method they concluded "…no statistically significant risk-return relationship is found in any of the test periods…" The second method they used was the conditional method developed by Pettengill et al. (1995). In their findings they state, "…although a positive risk-return relationship during up market periods and a negative risk return relationship during down market periods are observed, the results are not statistically significant for all periods of research…"

In summary we, as researchers, have come to believe that there is still ample room for growth in exploring these concepts around CAPM formula and its different variables. Through all of this reading one thing really stands out and that is: in every time period studied and each example used the betas set by the time period and current market status has an enormous impact on the results in varying directions.

DATA AND METHODOLOGY

Data collected quarterly from 1998 Quarter 1 – 2018 Quarter 4 from FRED from Federal Reserve Bank of St. Louis (Real GDP growth, 10 Year Treasury Yield), Kenneth French's Website at Dartmouth College (HML, SMB and Risk Premium ($R_m - R_f$) and Wharton Research Data Services (WRDS) for the stock prices of NASDAQ 30 top weighted firms (See Appendix A for the list of companies), S&P 500 index and VIX. The stock returns are calculated by using $r = (P_1\text{-}P_0)/P_0$ for each firms and market returns.

The methodology we are going to use is Capital Asset Pricing Model (CAPM) is the main equation to be used in our analysis and S&P 500 index will be used as the market return. Equation 1 will be estimated for the portfolio of stocks. Three month Treasury bill is used as risk free rate.

$$r_{it} = \alpha_i + \beta_1 (r_m - r_{rf}) + \beta_2 \Delta VIX_t + \beta_3 \Delta i_t + \beta_4 \Delta GDP_t + \beta_5 HML_t + \beta_6 SMB_t + \epsilon \quad (1)$$

where: r_{it} – required return on stock i
r_{rf} – Risk free rate
r_m – Market return (S & P 500)
β_1 – *beta* of stock
VIX_t – S&P 500 volatility index
i_t – current level of interest rate (10 Year T-Bill)
ΔGDP_t – GDP growth
HML_t – High minus low
SMB_t – Small minus big
ϵ – error term

The model to be employed is equation (1), which expands the CAPM and Fama & French (1993) three factor models by including macro level variables: the change in interest rate, GDP growth, and VIX (volatility of S&P 500 index). In the equation SMB (Small minus big) – is the difference between the returns on diversified portfolios of small and big stocks and HML (high minus low) – is the difference between the returns on diversified portfolios of high and low Book/Market value stocks.

Table 1 presents the summary of data. On the average the 30 firms NASDAQ stock returns in the past 21 years is 17.0% annually (From 1998 – 2018). While S&P 500 annual return the same period is 5.8 annually. The US real GDP growth in the past 21 years on the average is 9.2 percent per year. Table 2 presents the partial correlations of the variables and the result show Stock Return is highly positively correlated with Market Risk Premium ($R_m - R_f$), SMB, HML, and Real GDP growth. A stock return is negatively correlated with VIX and the change in VIX. Surprisingly the change in ten year Treasury bill rate is positively correlated with stock returns. Usually stock returns and interest rate are negatively correlated. This could be due to the recovery of the 2008/09 recession. Figure 1 and 2 show the stock returns of firms and indices of S&P 500 and NASDAQ over the study period.

TABLE 1
SUMMARY STATISTICS

Variables	No. of Obs.	Mean	Std. Dev	Min	Max
Stock Price	2223	108.353	210.344	0.09	2178.000
Returns	2191	3.994	36.666	-83.800	203.890
Mkt-R_f	2520	0.736	4.674	-17.230	11.350
SMB	2520	-0.426	3.174	-7.730	7.630
HML	2520	0.059	3.260	-11.100	8.610
ΔRealGDP	2520	2.298	2.402	-8.40	7.500
T-Bill 10 YR	2520	3.686	1.298	1.560	6.470
T-Yield 10 YR	2490	-0.180	10.706	-24.589	36.712
VIX	2520	20.221	7.922	10.180	59.890
ΔVIX (Change)	2490	3.615	30.452	-37.157	161.072
S&P 500 Index	2520	1474.353	490.616	825.880	2823.81
Mkt Return	2490	1.462	6.643	-23.563	16.471

Note: Top 30 firms that are components of NASDAQ Index frequency quarterly from 1998Q1 – 2018Q4. S&P 500 is used as market returns, SML, HML and R_f are collected from French's website at Dartmouth College.

TABLE 2
PARTIAL CORRELATION

Variables	Returns	$R_m - R_f$	SMB	HML	ΔReal GDP	T-Yield 10 YR	VIX	ΔVIX	Mkt. Returns
Returns	1.000								
$R_m - R_f$	0.195***	1.000							
SMB	0.089***	0.316***	1.000						
HML	0.053**	-0.069***	-0.111***	1.000					
ΔRealGDP	0.183***	0.354***	-0.039**	0.095***	1.000				
T-Yield 10 YR	0.176***	0.237***	0.066***	0.197***	0.166***	1.000			
VIX	-0.161***	-0.334***	0.049**	-0.237***	-0.415***	-0.282***	1.000		
ΔVIX	-0.207***	-0.505***	-0.228***	-0.153***	-0.368***	-0.215***	0.469***	1.000	
Mkt Return	0.356***	0.500***	0.138***	0.221***	0.510***	0.394***	-0.568***	-0.637***	1.000

Note: *, **, *** significance level at 10%, 5% and 1% level respectively. S&P 500 index is considered as the market return

FIGURE 1
QUARTERLY STOCK RETURNS OF 30 TOP COMPONENTS (FIRMS) OF NASDAQ INDEX 1998 Q1 – 2018 Q4

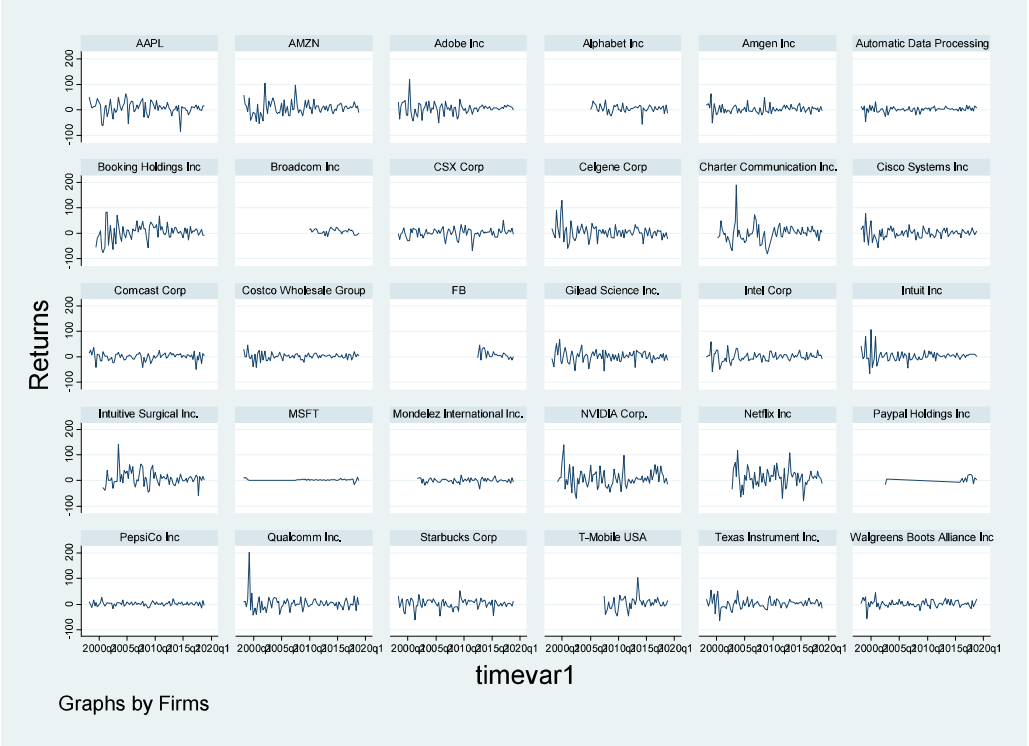


FIGURE 2
S & P 500 AND NASDAQ STOCK INDICES QUARTERLY- 1998 Q1 – 2018Q4

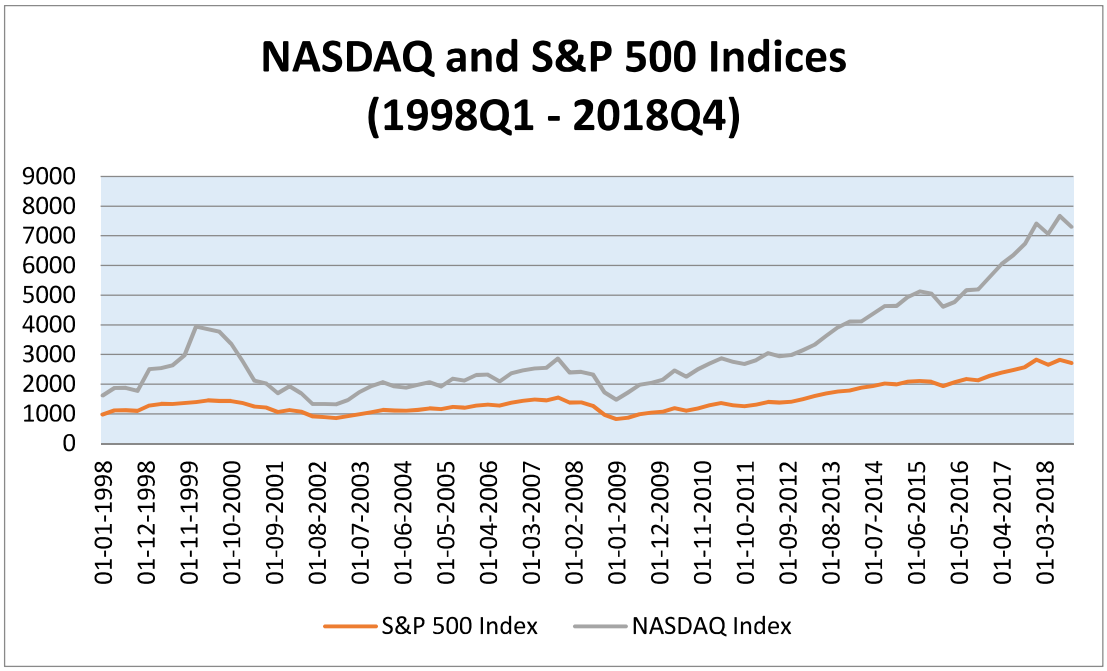
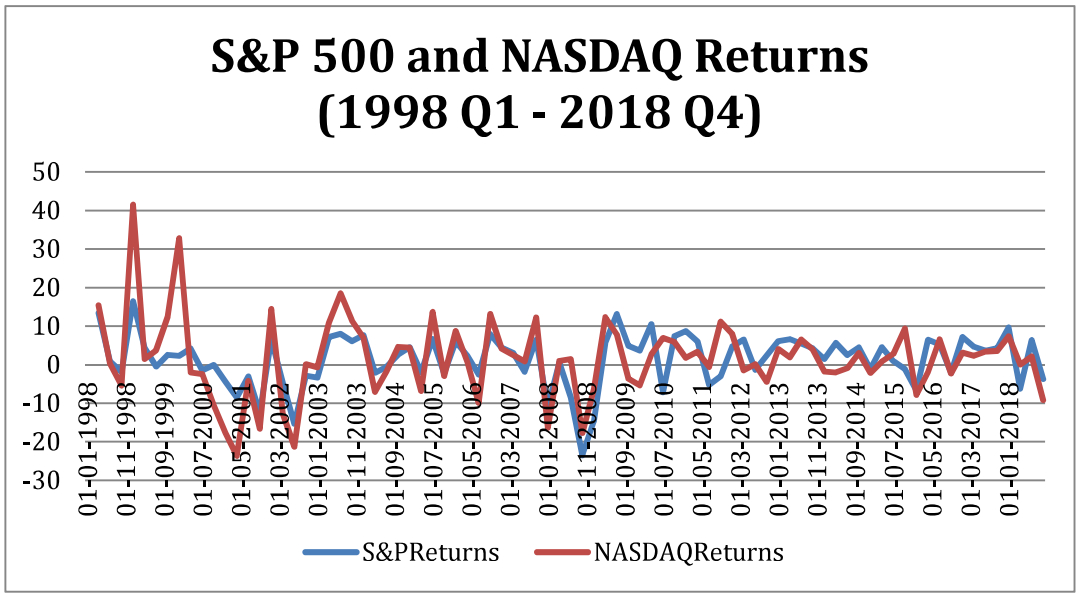


FIGURE 3
S & P 500 AND NASDAQ STOCK INDICES RETURNS QUARTERLY 1998 Q1 – 2018Q4



RESULTS

Tables 3 – 5 presents the fixed effect regression results, where the NASDAQ thirty stocks returns as a dependent variable and market risk premium ($R_m - R_f$), SMB, HML, 10 year Treasury yield, Real GDP growth, Change in VIX as independent variables including one variable at a time. Table 3 show the result of for all thirty firms all sampling period (1998Q1 -2018Q4) –the result indicates that Risk premium, SMB, T-Bill Yield, and Real GDP growth are positively correlated with stock returns while the change in VIX are negatively correlated with stock returns. But the ten year Treasury yield is statically significant predictor of stock returns with positive sign is unexpected. We divide the sample into two before the recession (Jan. 1998 – Dec. 2008) and after recession (Jan. 2009 – Dec. 2018) in order to see if the recovery is the reason for the positive relationship between interest rate and stock returns. However, the results of the two sub samples in Tables 4 and 5 are more or less similar to the total sample. That is the Ten Year Treasury Bill Yield in both Tables 4 and 5 are positively correlated with stock returns of the top 30 stocks of NASDAQ stock index components. Implying that the Tech stock returns are strongly positive correlated with interest rate, defying the historically established relationship that stock returns are negatively correlated with interest rates. The other difference between Tables 4 and 5 is that Real GDP growth is strongly significant only in Table 4 (Sample I) while the change in VIX is significant in only Table 5 (Sample II). The unusual and unexpected relation between ten year treasury yield and stock returns could be due to the recovery from the 2008/09 recession even when interest rate increases the stock return keep on increasing for the second sample.

TABLE 3
FIXED EFFECT MODEL: STOCK RETURNS DEP VARIABLE NASDAQ TOP 30 FIRMS FROM 1998Q1 - 2018Q4

	(1)	(2)	(3)	(4)	(5)	(6)
$R_m - R_f$	0.911***	0.868***	0.874***	0.719***	0.486***	0.304**
	(0.098)	(0.104)	(0.104)	(0.106)	(0.114)	(0.123)
SMB		0.196	0.241	0.263*	0.381**	0.292*
		(0.157)	(0.157)	(0.156)	(0.157)	(0.158)
HML			0.454***	0.258*	0.168	0.075
			(0.144)	(0.147)	(0.147)	(0.148)
T-BillYield				0.260***	0.248***	0.240***
				(0.044)	(0.044)	(0.044)
ΔRealGDP					1.137***	0.940***
					(0.210)	(0.215)
ΔVIX						-0.070***
						(0.018)
Const.	3.302***	3.423***	3.407***	3.584***	1.306**	2.113***
	(0.466)	(0.476)	(0.475)	(0.472)	(0.630)	(0.661)
CHI-Square	33.26***	38.21***	41.13***	65.04***	91.27***	94.88***
R-Square(within)	0.015	0.017	0.019	0.029	0.041	0.043
N	2190	2190	2190	2190	2190	2190

Standard errors in parentheses * p<.10, ** p<.05, *** p<.01T-Bill yield is 10 Year Treasury yield

TABLE 4
FIXED EFFECT MODEL: STOCK RETURNS DEP VARIABLE NASDAQ TOP 30 FIRMS FROM 1998Q1 - 2008Q4 – SAMPLE I

	(1)	(2)	(3)	(4)	(5)	(6)
$R_m - R_f$	1.074***	1.022***	1.136***	0.888***	0.513**	0.383
	(0.165)	(0.171)	(0.175)	(0.182)	(0.201)	(0.259)
SMB		0.279	0.379	0.142	0.371	0.333
		(0.238)	(0.239)	(0.243)	(0.247)	(0.251)
HML			0.710***	0.551**	0.431*	0.282
			(0.244)	(0.244)	(0.244)	(0.307)
T-BillYield				0.526***	0.330***	0.323***
				(0.117)	(0.125)	(0.126)
ΔRealGDP					1.517***	1.392***
					(0.355)	(0.388)
ΔVIX						-0.034
						(0.043)
Const.	2.824***	2.881***	2.732***	3.286***	-0.440	0.105
	(0.825)	(0.826)	(0.825)	(0.826)	(1.196)	(1.377)
CHI-Square	14.78***	18.23***	20.44***	38.09***	48.95***	48.95***
R-Square(within)	0.014	0.0176	0.0196	0.036	0.047	0.047
N	1039	1039	1039	1039	1039	1039

Standard errors in parentheses *p<.10, ** p<.05, *** p<.01. T-Bill yield is 10 Year Treasury yield

TABLE 5
FIXED EFFECT MODEL: STOCK RETURNS DEP VARIABLE NASDAQ TOP 30 FIRMS FROM 2009Q1 - 2018Q4 – SAMPLE II

	(1)	(2)	(3)	(4)	(5)	(6)
$R_m - R_f$	0.676***	0.622***	0.539***	0.403***	0.377***	0.288**
	(0.107)	(0.122)	(0.125)	(0.126)	(0.132)	(0.134)
SMB		0.188	0.234	0.474**	0.503**	0.330
		(0.202)	(0.203)	(0.205)	(0.209)	(0.215)
HML			0.421**	0.114	0.085	0.195
			(0.165)	(0.172)	(0.177)	(0.180)
T-BillYield				0.205***	0.210***	0.192***
				(0.038)	(0.038)	(0.038)
ΔRealGDP					0.185	0.165
					(0.268)	(0.267)
ΔVIX						-0.059***
						(0.019)
Const.	4.107***	4.314***	4.505***	4.690***	4.358***	4.500***
	(0.566)	(0.615)	(0.626)	(0.632)	(0.797)	(0.797)
CHI-Square	40.06***	40.970***	47.75***	78.83***	79.29***	89.83***
R-Square(within)	0.035	0.036	0.041	0.066	0.066	0.075
N	1151	1151	1151	1151	1151	1151

Standard errors in parentheses * p<.10, ** p<.05, *** p<.01. T-Bill yield is 10 Year Treasury yield

Furthermore, we investigate the relationship will stay the same by using System Generalized Method of Moments (GMM) using Real GDP growth included in the models as endogenous variable. Since GDP growth and Stock returns could happen helping one another. The results of System GMM are presented in Tables 6, 7 and 8. The Models goodness of fit measures M2 and Hansen-J did not reject the null hypothesis and the numbers of instruments are not greater than the number of groups so the system GMM models are good. The stock returns lags are weakly significant in all three Tables. In Table 6 (whole sample) the most significant variables are SMB, HML and T-Bill Yield with SMB and T-Bill positive coefficient while HML with negative coefficient. In the first sample (Table 7) results T-Bill yield lost its significance while SMB and HML remain significant. In addition Real GDP growth and Risk premium become statistically significant in the first sample (i.e. 1998 Q1 – 2008Q4). Finally, the results of Table 8 (Sample II - 2009Q1 – 2018Q4) indicates that market risk premium, Real GDP growth, SMB, HML and T-Bill yield become significant. Indicating that Sample II Treasury Bill yield is positively related while in sample I, lost its significance. The result suggest that second sample (2009Q1 – 2018Q4) recovery from recession show positive relationship between stock returns and interest rate while in the first sample interest rate is not significant predictor of stock returns.

TABLE 6
SYSTEM GMM MODELS: DEPENDENT VARIABLE STOCK RETURNS - REAL GDP GROWTH IS USED AS ENDOGENOUS – ALL SAMPLE (1998 Q1 – 2018 Q4)

	(1)	(2)	(3)	(4)	(5)	(6)
Returns (lag)	0.095	0.107	0.052	0.373**	0.163	0.183
	(0.095)	(0.097)	(0.098)	(0.151)	(0.182)	(0.191)
R_m - R_f	1.086***	1.163***	-0.501	0.636	-0.354	-0.244
	(0.172)	(0.249)	(0.446)	(0.489)	(0.716)	(0.729)
ΔRealGDP		-0.369	3.161***	-1.187	0.946	0.730
		(0.670)	(1.019)	(1.292)	(1.741)	(1.679)
SMB			2.331***	0.962	2.271**	2.227**
			(0.688)	(0.701)	(1.023)	(1.013)
HML				-2.071***	-1.365**	-1.586*
				(0.493)	(0.586)	(0.852)
T-Bill Yield					0.272**	0.258**
					(0.112)	(0.118)
ΔVIX						0.015
						(0.043)
Cons.	2.716***	3.414**	-1.769	5.093***	2.615	2.856
	(0.514)	(1.378)	(1.466)	(1.870)	(2.236)	(2.089)
M2	-0.490	-0.390	-0.670	1.010	-0.010	0.070
	(0.628)	(0.699)	(0.500)	(0.312)	(0.991)	(0.942)
Hansen-J	0.000	0.000	0.120	1.070	0.230	0.080
	(0.984)	(0.952)	(0.733)	(0.301)	(0.632)	(0.783)
N	2157	2157	2157	2157	2157	2157
No. of Instruments	11	11	11	11	11	11

Standard errors in parentheses * p<.10, ** p<.05, *** p<.01. T-Bill Yield is ten year Treasury Bill Yield.

TABLE 7
SYSTEM GMM MODELS: DEPENDENT VARIABLE STOCK RETURNS - REAL GDP GROWTH IS USED AS ENDOGENOUS SAMPLE I (1998 Q1 – 2008Q4)

	(1)	(2)	(3)	(4)	(5)	(6)
Returns (lag)	-0.145*	-0.210**	-0.206**	-0.110	-0.112	-0.102
	(0.085)	(0.085)	(0.087)	(0.100)	(0.096)	(0.094)
$R_m - R_f$	1.526***	0.271	0.265	0.621*	0.602	1.196**
	(0.208)	(0.392)	(0.393)	(0.344)	(0.395)	(0.487)
ΔRealGDP		2.346***	1.779**	1.131	1.127	1.151
		(0.804)	(0.786)	(0.690)	(0.689)	(0.701)
SMB			1.642***	1.820***	1.830***	2.083***
			(0.514)	(0.549)	(0.567)	(0.643)
HML				-0.911***	-0.919***	-0.637
				(0.326)	(0.338)	(0.387)
T-Bill Yield					0.022	-0.071
					(0.164)	(0.173)
ΔVIX						0.071
						(0.065)
Cons.	3.182***	-2.099	-0.442	1.010	1.053	0.387
	(0.799)	(1.545)	(1.620)	(1.570)	(1.614)	(1.887)
M2	-0.990	-1.110	-1.060	-0.890	-0.920	-0.860
	(0.332)	(0.266)	(0.290)	(0.375)	(0.356)	(0.389)
Hansen-J	1.850	1.590	0.150	0.150	0.150	0.770
	(0.174)	(0.208)	(0.696)	(0.694)	(0.694)	(0.380)
N	1010	1010	1010	1010	1010	1010
No. of Instruments	11	11	11	11	11	11

Standard errors in parentheses * p<.10, ** p<.05, *** p<.01. T-Bill Yield is ten year Treasury Bill Yield

TABLE 8
SYSTEM GMM MODELS: DEPENDENT VARIABLE STOCK RETURNS - REAL GDP GROWTH IS USED AS ENDOGENOUS. SAMPLE II (2009 Q1 – 2018Q4)

	(1)	(2)	(3)	(4)	(5)	(6)
Returns (lag)	0.165	0.109	0.111	0.283**	0.117	0.118
	(0.135)	(0.135)	(0.134)	(0.126)	(0.131)	(0.136)
$R_m - R_f$	1.102***	0.927***	0.711**	0.450	-0.711	-0.692
	(0.143)	(0.204)	(0.341)	(0.360)	(0.502)	(0.582)
ΔRealGDP		0.589	0.949	1.526**	3.148***	3.086**
		(0.409)	(0.637)	(0.719)	(0.926)	(1.333)
SMB			0.425	0.797	2.863***	2.812**
			(0.610)	(0.646)	(0.912)	(1.159)
HML				-0.831***	-1.298***	-1.273***
				(0.278)	(0.281)	(0.401)
T-Bill Yield					0.336***	0.333***
					(0.091)	(0.109)
ΔVIX						-0.003
						(0.033)
Cons.	2.526***	1.878**	1.734**	0.290	0.528	0.600
	(0.645)	(0.817)	(0.874)	(1.057)	(1.107)	(1.389)
M2	0.910	0.540	0.580	1.460	1.390	1.400
	(0.361)	(0.587)	(0.564)	(0.143)	(0.164)	(0.162)
Hansen-J	0.070	0.000	0.020	0.000	0.110	0.220
	(0.797)	(0.952)	(0.883)	(0.963)	(0.744)	(0.641)
N	1147	1147	1147	1147	1147	1147
No. of Instruments	11	11	11	11	11	11

Standard errors in parentheses * p<.10, ** p<.05, *** p<.01. T-Bill Yield is ten year Treasury Bill Yield

SUMMARY AND CONCLUSION

We revisited Capital Asset Pricing Model (CAPM) using Quarterly date from 1998Q1 until 2018Q4 to predict the thirty companies of NASDAQ components using S & P 500 as the market index and using independent variables: market risk premium, SMB, HML, real GDP growth, ten year Treasury yields and the change in VIX as predictor. The results show that Risk Premium, Real GDP growth, VIX and SMB are good predictors of overall stock returns. Surprisingly ten year Treasury yield was statistically significant predictor of stock returns in the whole sample with positive relationship with stock returns. However, when we break the sample in to two groups before and after 2009 before 2009 the ten year Treasury yield become positively related to stock returns only after 2009 (Sample II) in the system GMM model. Indicating that the unusual relationship between stock returns and ten year treasury yield could possibly be explained by: stock market in the second sample period is in recovery period and stock returns are increasing while interest rate is also increasing.

In general, our results indicate that risk premium, real GDP growth, and Treasury Yield are consistent predictors of stock returns – with positive coefficient. On the other hand SMB and the change in VIX are negatively significant and weak predictor of stock returns.

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APPENDIX A
THE LIST OF 30 STOCKS OF NASDA COMPONENT INCLUDED IN THE STUDY

Components of the Nasdaq 30			
#	Company	Symbol	Weight
1	Microsoft Corp	MSFT	11.092
2	Amazon.com Inc	AMZN	10.342
3	Apple Inc	AAPL	9.678
4	Facebook Inc	FB	5.077
5	Alphabet Inc	GOOG	4.547
6	Cisco Systems Inc	CSCO	3.007
7	Intel Corp	INTC	2.555
8	Comcast Corp	CMCSA	2.432
9	PepsiCo Inc	PEP	2.313
10	Netflix Inc	NFLX	1.958
11	Adobe Inc	ADBE	1.713
12	PayPal Holdings Inc	PYPL	1.659
13	Costco Wholesale Corp	COST	1.362
14	Amgen Inc	AMGN	1.352
15	Broadcom Inc	AVGO	1.293
16	Texas Instruments Inc	TXN	1.256
17	Starbucks Corp	SBUX	1.203
18	NVIDIA Corp	NVDA	1.092
19	Charter Communications Inc	CHTR	1.087
20	Gilead Sciences Inc	GILD	1.038
21	QUALCOMM Inc	QCOM	1.022
22	Booking Holdings Inc	BKNG	0.975
23	Mondelez International Inc	MDLZ	0.949
24	Automatic Data Processing Inc	ADP	0.895
25	Celgene Corp	CELG	0.846
26	T-Mobile US Inc	TMUS	0.831
27	Intuit Inc	INTU	0.831
28	CSX Corp	CSX	0.775
29	Intuitive Surgical Inc	ISRG	0.694
30	Walgreens Boots Alliance Inc	WBA	0.620