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ABSTRACT

This study examined monthly government bonds response to announcements about Consumer price index (CPI) beginning from July 2001 to September 2009.The findings significantly supported that the consumer price index (CPI) causes the government bonds and also the non-seasonal lags (AR1) of government bonds cause the government bonds. The data used for the research was secondary and taken from the internet and also from State bank of Pakistan. The consumer price index was an independent variable and government bonds a dependent variable. In this research auto-regressive, integrated, moving-average (ARIMA) models for time series data was used. A time series was a set of observations ordered according to the time that were observed.

Key words: Consumer price index (CPI), Government bonds, ARIMA.

Introduction

The purpose of this study is to examine the monthly government bonds response to announcements of consumer price index (CPI).

Previous studies had examined that the financial markets response to the consumer price index (CPI) announcements. But this research was only concerned with the hypothesis that consumer price index has significant association with the government bonds.

Consumer Price Index (CPI)

Inflation was measured by price indices. A price index was a measure of the collective price level relative to a chosen base year.

A consumer price index (CPI) was an estimated average price of consumer goods and services acquired by households. CPI measures price increases and decreases on common group of user goods and services on a monthly basis, it calculates by taking a weighted average of price change for a pre-given group of goods. The consumer price index was much linked but not to be confused with, to the cost of living index which allowed for replacement of the items as prices move upper or lesser.

Many economists analysed that the key indicator is the Core CPI which measures two most unstable components, food and energy. This allowed economists to truly realize if goods and services which had stable increase in price were starting to accelerate faster than the average rate.

CPI was a most important measure of price changes at retail level. CPI specified the price of buying a representative permanent basket of goods and services committed by special families. In Pakistan CPI cover up the retail prices of 374 items in 35 major cities and reflect almost the changes in the cost of living of urban areas.

Government Bond

A Government bond was an official paper given by the government or a company to show that an investor had lent government or company, money that government or company can pay back to an investor at an interest rate that did not change.

If a business wants to develop, one of alternatives was to borrow funds from single entity, financier or shared funds. The corporation issues bonds at different interest rates and put up for sale bonds to the public. Investors purchase bonds with the perceptive that the corporation can pay back the investor's principal amount (the amount the investor finance to the corporation) with any interest that was due by a maturity date.

According to the strength of the corporation which issues bonds, the bondholder expected a rate of interest.

Literature Review

Smirlock (1986) examined the response of the long-term bond market to inflation announcements. Smirlock (1986) study discovered a significant positive response of long-term rates to unpredicted price increases. This result may be consistent with either increases in expected inflation (the expected inflation hypothesis) or potential of a tighter monetary policy (the policy anticipation hypothesis).

Smirlock (1986) study classified the post-announcement period as being the five trading days straight away after the announcement day t, i.e., day's t + 1 to t + 5. The five days match to the first trading week following the inflation announcements. As the anticipated component of inflation announcements did not affect interest rates, to study the speed of adjustment.

The results supported the existence of efficient markets based on the dual finding that the market responded only to the unexpected and not at all to the predictable component of inflation announcements and that almost was the entire market adjustment complete by the end of the announcement day.

Kim and Shukla (2006) study showed that the price increase sensitivity of a security was positively or negatively linked to the sensitivity to the world bond index (world stock index). Whereas, the model was appropriate to one person securities and portfolios, was experienced by means of portfolios only. Kim and Shukla (2006) study showed that the outcome permits individual to evaluate the price raises sensitivity of a security via the sensitivity to the bond and the stock market.

Kim and Shukla (2006) study examines that the inflation sensitivity of a security was negatively related to the stock characteristic (sensitivity to a stock factor) and positively related to the bond characteristic (sensitivity to a bond factor). The results of the tests with international stock returns of 23 countries and 83 international equity shared funds supported the hypothesis. Thus, the sensitivities of securities' returns to bond and stock market returns may be used to assess the sensitivities to inflation.

Ilmanen (1995) examined the expected difference in long-maturity government bond returns. A set of worldwide mechanism can predict 4 to 12 percent of monthly dissimilarity in excess bond returns. The expected variation was statistically and economically significant. Furthermore, predictable excess bond returns were extremely correlated across countries.

Model with one worldwide risk factor and stable restricted betas explained international bond return certainty, if the risk factor be proxies by the world excess bond return.

Bond returns was influenced by relatively few factors. The excess returns of long-term government bonds' was focused only to interest rate risk. There was no default risk or cash flow uncertainty and almost all foreign exchange risk can be enclosed. The simplicity of government bonds made possible the identification of useful forecasting instruments and the interpretation of empirical findings. Any return predictability can reflect the time-varying reward for bearing interest rate risk.

Relative risk aversion (RRA) fluctuated inversely with "relative wealth" and that such variation explained the observed counter cyclic pattern in expected asset returns. Investors were more risk averse when the wealth was low relative to the past wealth. Given the higher risk aversion, which demand larger compensation for holding risky assets such as stocks and long-term bonds.

There was also used conditional asset pricing models and test the ability which explain the bond return expectedness. The test of a single latent variable model indicated that expected excess bond returns was proportional to the expected excess return of one unobservable risk factor.

The conclusions implied that expected excess returns were highly correlated across international bond markets and less highly correlated between the world stock and bond markets.

Cochrane and Piazzesi (2005) studied time variation in projected surplus bond returns. Cochrane and Piazzesi (2005) ran regressions of one-year surplus returns on before time forward rates. This study came across that a single issue, a single tent-shaped linear mixture of forward rates, forecasted surplus returns on 1 to 5 year maturity bonds throughout R2 up to 0.44. The return- forecasting issue was countercyclical and predicted returns on stock. An important part of the return- forecasting issue was not related to the phase, angle and curved movements described by the majority term arrangement models.

Campbell and Ammer (1993) used a vector autoregressive model to decompose surplus stock and 10 year returns on bond into changes in opportunity of potential stock dividends, price rises or falls, temporary real interest rates and surplus returns on stock and bond. Stock and bond returns given in monthly postwar U.S. data, was fixated mostly by reports about future surplus returns on stock and inflation, respectively. The result helped to explain the low correlation between excess stock and bond returns.

Campbell and Ammer (1993) study indicated that unexpected excess bond returns must be associated either with decreases in expected inflation rates over the life of the bond, or with decreases in expected future real returns on the bond. The latter can take the form either of decreases in future real interest rates or of decreases in future excess bond returns. Campbell and Ammer (1993) said that the maturity of the bond shrinks as time passes, so the relevant expectations was for the returns on a bond that had a maturity of (n - i) at time t + i. Changes in expected inflation rates appeared because this could alter the expected real value of the fixed nominal payoff on the bond, so that can cause capital gains and losses even if expected real bond returns was constant.

Objective of this research was to evaluate how futures trading in existing contracts changes in response to changes in uncertainty caused by inflation (Carlton, 1983). A Several different measures for PI (a measure of inflation that affects uncertainty) were used to reflect different beliefs about how inflation causes uncertainty. The different measures of PI that were used was (a) inflation and the absolute value, (b) inflation squared, (c) the absolute deviation of inflation from a four-year average and (d) the absolute deviation of inflation from an ARIMA model of inflation. The first two measures reflected the idea that inflation generated uncertainty about prices whereas the last two measures reflected the belief that this

was only unexpected inflation that generated uncertainty about prices. Carlton (1983) observed the important association between uncertainty created by inflation and the volume of futures trading. The interrelationship between different futures markets was studied and this was shown that interrelationship could be used to evaluate the likelihood of various futures markets.

Research Method

Theoretical Framework

ARIMA technique was applied on the 99 months period data of government bonds and consumer price index (CPI) to test the hypothesis that "Consumer price index (CPI) had significant association with the government bonds".

Different techniques were used by the different author to test that there was any association between consumer price index (CPI) and government bonds.

Same model was used by Carlton (1983) to evaluate how futures trading in existing contracts changes in response to changes in uncertainty caused by inflation. A Several different measures for PI (a measure of inflation that affects uncertainty) were used to reflect different beliefs about how inflation causes uncertainty. The different measures of PI that were used was (a) inflation and the absolute value, (b) inflation squared, (c) the absolute deviation of inflation from a four-year average and (d) the absolute deviation of inflation from an ARIMA model of inflation. The first two measures reflected the idea that inflation generated uncertainty about prices whereas the last two measures reflected the belief that this was only unexpected inflation that generated uncertainty about prices.

Carlton (1983) examined the important relationship between uncertainty created by inflation and the volume of futures trading. The interrelationship between different futures markets was examined and this was shown that interrelationship could be used to analyze the likelihood of various futures markets.

Data Collection

The sample period used in this study covered 99 monthly observations beginning from July 2001 to September 2009. The monthly government bonds data was obtained from State Bank of Pakistan and monthly consumer price index (CPI) data was obtained from Federal bureau of statistics.

This Research used a set of hypotheses to study the cause of consumer price index (CPI) on government bonds. The hypothesis was "Consumer price index (CPI) had significant association with the government bonds".

Methodological Model

ARIMA model was used to find out the relationship between consumer price index (CPI) and government bonds. And to test the hypothesis that "consumer price index (CPI) had significant association with the government bonds".

ARIMA was defined as an autoregressive integrated moving average model, simplification of an autoregressive moving average (ARMA) model. ARIMA models were fitted to the data of time series furthermore to better identify the data or to forecast future points in the series. ARIMA was useful in some cases where data show verification of non-stationary, where an early differencing step (equivalent to the "integrated" part of the model) can be applied to eliminate the non-stationary. The ARIMA procedure allows the researcher to create an autoregressive integrated moving-average (ARIMA) model suitable for finely tuned modeling of time series. ARIMA models provided more sophisticated methods for

modeling trend and seasonal components than did exponential smoothing models which allow the added benefit of including predictor variables in the model.

An ARIMA model was typically expressed as ARIMA (p, d, q), where p was the order of auto regression, d was the order of differencing (or integration) and q was the order of moving-average involved. The components were used to explain significant correlations found in the autocorrelation (ACF) and partial autocorrelation (PACF) plots and to handle trends.

Data Analysis

Table 1:

Autocorrelations

Series: investment on bonds

Lag	Autocorrelation	Std. Error[a]	Box-Ljung Statistic		
			Value	df	Sig.[b]
1	.046	.114	.162	1	.687
2	.089	.114	.770	2	.680
3	.119	.116	1.816	3	.612
4	.121	.107	3.105	4	.540
5	.254	.112	8.301	5	.140
6	.042	.109	8.446	6	.207
7	.025	.109	8.498	7	.291
8	-.063	.101	8.881	8	.352
9	-.014	.093	8.902	9	.446
10	.176	.096	12.257	10	.268
11	-.130	.093	14.212	11	.221
12	-.019	.084	14.263	12	.284
13	-.091	.093	15.220	13	.294
14	-.113	.084	17.019	14	.255
15	-.062	.087	17.532	15	.288
16	.009	.077	17.545	16	.351

a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

Interpretation of Econometrical Findings

Consumer price index (CPI) predicts investment in government bonds that are significant as significance value was 0.000, stationary R squared was 0.096 and R squared was 0.096.

Autocorrelation (ACF) table shows that autocorrelation in investment on government bonds of all 16 lags are insignificant and Partial autocorrelation (PACF) table shows that partial autocorrelation in investment on government bonds of all 16 lags are insignificant which means today's investment in government bonds were not affected by the yesterday's investment in government bonds.

Table 2:
Hypotheses Assessment Summary

Hypotheses	Number of Predictors	Stationary R-squared	R-squared	Significance value	Empirical Conclusion
CPI predicts government bonds	yes	0.096	0.096	0.000	Accepted

Results

As mentioned in the previous chapters that two different scenarios data had been collected, government bonds data was obtained from State Bank of Pakistan and consumer price index (CPI) data was obtained from Federal bureau of statistics. The data had been taken of monthly government bonds and monthly consumer price index (CPI) which was mentioned on the base secondary data that explained cause of consumer price index (CPI) on government bonds. "Consumer price index (CPI) had significant association with the government bonds", this hypothesis explored that ARIMA results were statistically significant, which means that consumer price index (CPI) had cause on government bonds.

Kim and Shukla (2006) study examined the cross-sectional variant in the sensitivity of returns to inflation for international securities. Kim and Shukla (2006) suggested that the rise in price sensitivity of a security was absolutely associated to the bond features (sensitivity to a bond factor). Kim and Shukla (2006) showed that the conclusion allows single person to analysis the inflation sensitivity of a security using the understanding to the bond. The further bond-like a security was the superior to the sensitivity to price increases. Therefore, the sensitivities of securities' returns to bond market returns may be used to assess the sensitivities to inflation.

Conclusion, Discussion and Implications

The objective of the study was to find out what cause had consumer price index (CPI) on government bonds. This study had examined the monthly government bonds response from the beginning of July 2001 to September 2009 to announcements of consumer price index (CPI), used secondary data for analysis of effectiveness. ARIMA results supported the hypothesis that "Consumer price index (CPI) had significant association with the government bonds", but the non-seasonal lags (AR1) of government bonds causes the government bonds.

A Several different measures for PI (a measure of inflation that affects uncertainty) were used to reflect different beliefs about how inflation causes uncertainty. The different measures of PI that were used was (a) inflation and the absolute value, (b) inflation squared (c) the absolute deviation of inflation from a four-year average and (d) the absolute deviation of inflation from an ARIMA model of inflation. The first two measures reflected the idea that inflation generated uncertainty about prices whereas the last two measures reflected the belief that this was only unexpected inflation that generated uncertainty about prices.

The study point out that unexpected excess bond returns can be associated either with decreases in expected inflation rates over the life of the bond, or with decreases in expected future real returns on the bond. The latter can take the form either of decreases in future real interest rates or of decreases in future excess bond returns. Author says that the maturity of the bond shrinks as time passes, so the significant expectations was for the returns on a bond that had a maturity of (n - i) at time t + i. Changes in expected inflation rates came out

because this could alter the expected real value of the fixed nominal payoff on the bond, so this can cause capital gains and losses even if predictable real bond returns was constant.

Recommendation

Future research can be done to check the relationship of consumer price index (CPI) with stock prices and stock returns or with different financial markets like foreign
Exchange market.

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