Chapter 1

INTRODUCTION

1.1 General Background

Financial sector of any country plays vital role in the country's economic growth. Stock market is one of the key institutions of the financial sector which provides a platform, where a borrower and lender can easily fulfill their financial needs. Performance of stock market is the factual reflection of country's economic performance.One of the major avenues of investment that has the potential of yielding considerable returns to investors is the investment in equity and shares. It is the main source of finance for the capital requirement of firms or enterprises. (www.wikipedia.com).

Security market is the market mechanism created to facilitate the exchange of financial securities or asset bringing together buyer and seller of securities (Sharpe, 1998). Securities market provide effective way of procuring long term funds by issuing shares and debentures or bonds for corporate enterprises and governments. The capital market serves as a very useful purpose of pooling the saving of individuals and making them available to the business world. A well developed capital market can solve the problem of paucity of funds for the business enterprises. Thus the market place for these financial securities is called financial market which is further divided into primary and secondary market. The former market denotes the market for newly issued securities to the public whereas the latter market refers to the market for the second hand securities, traded previously in the primary market (Francis, 1991).

Stock exchange market is a long term capital market where both new capitals scan be raised by companies and where existing shares can also be bought and sold. The stock exchange also provides a market for governments' loans and securities and increasingly involved in the buying and selling of the securities in the overseas companies. On the market, the main operators are the market makers who trade in a group of share and the stock broker who act as agents for their clients, who are investors who are actually buying and selling shares. New York stock exchange, London stock exchange, Tokyo stock exchange, Paris stock exchange, Frank fruit exchange, Toronto stock exchange are the biggest stock exchange of the world. Nepal stock exchange is the only organized stock exchange of Nepal (www.wikipedia.com).

In addition to boosting domestic saving, stock market improves both the quality and quantity of investment by providing the market with additional financial instruments that better meet the risk and liquidity preference of different individual (Singh 1997). Furthermore stock market provides an alternative source of capital for growing firms. This reduce the risk of credit crunch by reducing firm dependency on bank borrowing (Yartey and Adjasti , 2007).

However the role, the stock market plays with regards to economic growth has been one of the most debate subject matter among economists. Empirical studies done by Levine (1997), Filler et al (1999) and Beck and Levine (2002) have shown that there is positive relationship between stock market development and economic growth on the other hand some literature argues to the contrary, for instance, Bhide (1994) argues that stock market liquidity encourages investors' myopia and reduce their commitment and investment incentives. This is because investors can readily switch their investment to other avenues at lower cost. Singh (1997) also argue that the operating of the pricing and take over mechanism encourages short term and also the long term investments since manager becomes more concerned with improving share price other than creating long term wealth. Empirical evidence from Singh (1971 in Yartey and Adjasi 2007) further indicates that the takeover arguments do not hold in practice.

The increasing prominence of stock market in Nepal is one of the striking features of financial development over the last decades. Security exchange center limited was established in 1976 to facilitate and promote the growth of capital market (www.nepse.com). As part of the economic liberalization program, it was converted into Nepal stock exchange (NEPSE) under a program to reform capital market in 1993 (www.nepse.com). In January 1994, NEPSE opened the public share based on the open outcry system with twenty-five brokers and three market makers (www.nepse.com). Since then Nepal has brought about a number of change in order to upgrade itself and provide efficient and reliable services.

The recent form has focused on enhancing institutional developments. To ensure transparency and dynamism in stock transaction, the open voice bidding system was replaced by computerized transaction. The NEPSE adopted the automated trading system (ATS) instead of open cry out trading system from august 24, 2007, permitting a high degree of price transparency and real time price Quotations (www.nepse.com). The ATS has started online trading through Wide Area Network (WAN). Now the brokers are able to trade via computers either on the floor of the exchange or from their offices. As NEPSE become more systematic, it has implemented index based circuit breakers with effect from 21 September 2007 (www.nepse.com). In addition to the circuit breakers, price range is also applicable on individual securities to stabilize the volatility of stock market. The evolving capital market is starting to attract small investor, which is a good sign for its further consolidation.

Stock market performance, economic and political condition of the country is interrelated. Many studies directly and indirectly have dealt with the macro and institutional factors and their correlation with the stock market performance at both theoretical and empirical levels (www.wikipedia.com). However Nepalese stock market is not deeply researched in terms of factors affecting stock price. Therefore macroeconomic determinants of stock market performance in Nepal can be examined using a time series data for the period of 1994 to 2011.

1.2 Statement of the Problem

With the growing interest in this area, more and more studies, some of which have been mentioned in the empirical literature review section, examined volatility effects of macroeconomic variables on stock prices. This study aims at answering the question whether or not macroeconomic factors namely; money supply, GDP growth rate, exchange rate and inflation have a role to play in determining stock return and volatility on the Nepalese stock market. In addition to that, the study also examines whether the macroeconomic effects on stock return and volatility are asymmetric or not.

Only few investors of Nepalese stock market are aware of the factors affecting share price .It means that most of the investors are unknown about financial performance of the company but tend to invest in the company without proper financial analysis. They depend on financial indicators viz. earning price per share (EPS), Book value per share (BPS), Dividend per share (DPS) etc probably because of this most of the researches are found on this subject matter and there are negligible researches found which states the relationship between macroeconomic variables and stock price. In order to address the problem of Nepalese investor this study is an attempt to show the relationship between macroeconomic variables and stock price. Along with these there may be some qualitative factors that determine stock price. However, to specify exactly what factors determine stock price is a controversial issue. So in this state this research will try to answer some questions. More specifically this study is expected to answer the following research question:

a) What is the trend of a Macroeconomic Variables viz. NEPSE, GDP growth rate, Inflation and Money Supply in Nepal?
b) What is the impact of macroeconomic variables on stock price in Nepal?

1.3 Objectives of the Study

The objectives of the study are listed below:

a) To show the trend relationship of Macroeconomic Variables viz. NEPSE, GDP growth rate, Inflation and Money Supply.
b) To examine and analyze the impact of macroeconomic variables viz.GDP growth rate, inflation rate and money supply on stock price (NEPSE).

1.4 Significance of the study

This empirical study is performed to determine the magnitude and direction of stock price and macroeconomic variables. The result of the study is expected to give significant importance to the society. The first notable significance is that the observation and conclusion drawn from the result will help macroeconomists and policy makers to come up with better policies, as a result will provide information of the potential macroeconomic determinants which reduces risks in the financial sectors.

For any country whether developed or otherwise, it is important for policy makers to have a clear picture of the implications of the policies they make on all sectors of the economy. In this case knowing the way macroeconomic variables impact the stock market, will to some extent indicate to policy makers, the impact of their monetary policies on stock market. As a result it may guide them to come up with policies that encourage stock market performance for the development of the overall financial market and whole economy.

Apart from policy makers, the result of the study will also provide significant information to investors with regard to the best time to buy or sell depending on their understanding of the prevailing macroeconomic environment. For instance if the study demonstrate that an increase in interest rate will reduce stock returns , then investors will be able to take rational decision with regard to their investments.

There is a long standing belief that monetary policy has asymmetric effects when positive changes have less impact then negative changes. This has attributed to several reasons such as changing business and consumer outlook over the business cycle: credit constraints and price being less flexible downwards (Morgan, 1993). Knowledge of whether such asymmetric exists, may guide investors on how and to what extent they should react when macroeconomic policy change negatively or positively.

1.5 Limitations of the study

Major limitations of the study are:

a) Carrying out empirical studies of this nature need sufficient number of observations to find reasonably reliable results. In our case this has been the major limitation of the study as it covers only the period from 1994 to 2011 which is not sufficient enough.

b) This study will be based on the published secondary data and information and no attempts have been made to examine the reliability and validity of the data.

c) This study is based on only quantitative variable .Qualitative variables are not considered in the study.

d) The extent of the analysis may be constrained due to time and resources limitations.

1.6 Organization of the Study

The present study is organized in five chapters. The first chapter is an introductory part of the study covering the background of the study, statement of the problem, objectives of the study, rationale and study limitations. The second chapter covers the theoretical review and review of empirical studies at national and international level. The third chapter provides a glimpse of the methodology used in this study. The fourth chapter covers the analysis of data and finally, the fifth chapter presents the summary, conclusions and recommendations of this study.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents a brief review of some of the theories concerned with the theory of determining stock price in Section 2.2. Section 2.3 presents the review of the empirical studies and conclusion from the reviews has been discussed in Section 2.4.

2.2 The Theoretical Review

The Chronological Theory of stock price behavior starts with the Markowitz model (1952, 1959). The Markowitz model (a single-period model), showed exactly how an investor forms a portfolio at the beginning of the period and also, how to reduce the standard deviation of portfolio returns by choosing stocks that do not move exactly together. He worked out the basic principles of portfolio construction, which are the foundations of the relationship between risk and return. The two leading models in financial economics that attempt to explain the relationship between risk and asset returns are the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT). The simplest form of the asset pricing models is the one-factor Capital determined by the measure of the market price of risk, namely *beta*. The main parameters that the CAPM depends on are the mean and the variance of the returns. The APT predicts a relationship between the returns of a portfolio and the returns on any risky asset though a linear combination of many independent macroeconomic variables, but it does not explain how many risk factors there are and what the prices of these factors are. This chapter will also provide an insight into the stock market returns by analyzing the relationship between the stock market and macroeconomic variables and the integration of stock market.

2.2.1 The Capital Asset Pricing Model

The CAPM is a model for pricing an individual security or a portfolio. The CAPM model was developed independently by William Sharpe (1964), and Lintner (1965). This model marks the birth of asset pricing theory. The CAPM suggests that the only variables that we need in calculating the expected return on security are: the risk free rate (a constant), the expected excess return on the market, and the security's vita (a constant). The CAPM model is attractive because of its effectively simple logic and intuitively pleasing predictions relating to how it measures risk and the relation between expected return and risk. Unfortunately, the CAPM simplicity causes the empirical record of model to be poor, poor enough to invalidate the method used in the application of the model. The model's empirical problems may reflect true failings or they may also be due to the shortcomings of the empirical tests, most notably, poor proxies for the market portfolio of invested wealth, which plays a crucial role in the model's predictions.

The CAPM is built on the model of portfolio choice developed by Markowitz (1999). The Markowitz model is often known as a “mean-variance model”, it describes the relationship between risk and the expected return of an asset under the conditions of market equilibrium in a capital market where all investors undertake optimal portfolio selection. The model assumes investors are not risk takers and that they care only about the mean and variance of their one-period investment return when choosing among portfolios. As a result of this, investors tend to choose the mean and variance efficient portfolios, with the logic that the portfolios will minimize the variance of portfolio return given an expected return and maximize the expected return, given the variance.

Derivation of the CAPM

The CAPM is a simple linear model that is expressed in terms of expected return and expected risk. The model states that the equilibrium returns on all risky assets are a function of their covariance with the market portfolio.

Under the assumptions of the CAPM, if a risk-free asset exists, every investor’s optimal portfolio will be formed from a combination of the market portfolio and the risk-free asset. The precise combination of the market portfolio and the risk-free asset depends on the degree of investor’s risk aversion. Since investors can choose the combination of the market portfolio and the risk-free asset, then the equation of the relationship connecting a risk-free asset and a risky portfolio is

$$E\,(Ri) = Rf + \frac{E(Rm) - Rf}{\sigma 2m}\,\sigma im \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2.1)$$

Where;

E (Ri) : Expected return on *i*th portfolio.

R f : Return on the risk free asset

E (Rm) : Expected return on market portfolio

im : The covariance between asset *i* and the market portfolio

2 m : The variance of the market portfolio

Based on the equation (2.1) the original CAPM equation can be derived as follows:

E(Ri)= Rf+[E(Rm)-Rf]βi ……………………………………(2.2)

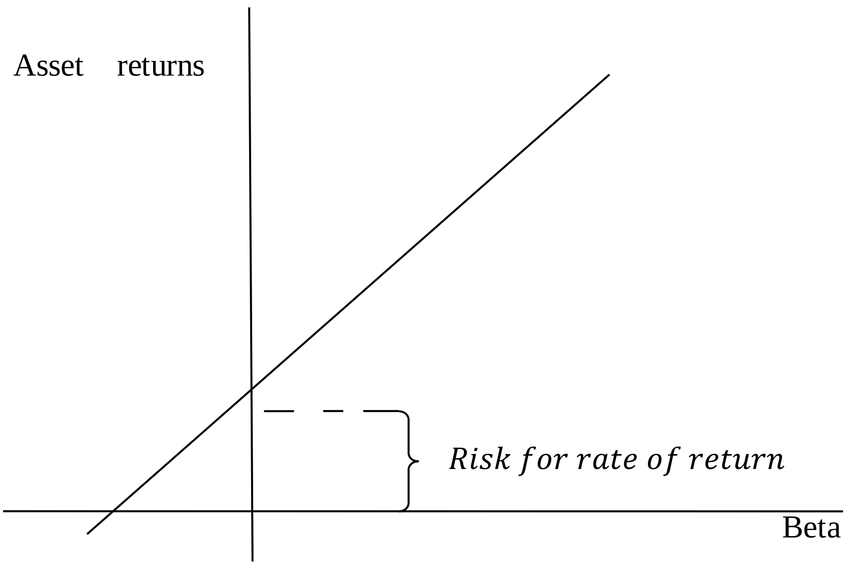

Figure 1.1: The Security Market Line describing a relation between the beta and the asset's expected rate of return.

Equation (2.2) is known as Capital Asset Pricing Model and it could be shown graphically as the security market line (SML) which means the SML fundamentally graphs the results from the capital asset pricing model (CAPM) formula. The *x*-axis represents the risk (beta), and the *y*-axis represents the expected return. The market risk premium is determined from the slope of the SML. The SML model states that a stock's expected return is equal to the risk-free rate plus a risk premium obtained by the price of risk multiplied by the quantity of risk. In a well-functioning market nobody will hold a security that offers an expected risk premium of less than [E(Rm)-R f] βi.

If we think E (Rm) – Rf as the market price of risk for all efficient portfolios, than, it represents the extra return that can be gained by increasing the level of risk on an efficient portfolio by one unit. The quantity of risk is often called beta, and it is the contribution of asset *i* to the risk of the market portfolio. In other words, it is the correlation of the asset *i'*s return with the return on the market portfolio.

If everyone holds the market portfolio, and if beta measures each security's contribution to the market portfolio risk, then it's no surprise that the risk premium demanded by investors is proportional beta. According to the CAPM the total risk of a security could be divided between systematic and unsystematic risk. The systematic risk is the portion of the security's return variance that is explained by market movements such as fiscal changes, swings in exchange rates and interest rate movements. On the other hand, the unsystematic risk is the variability in return due to factors unique to the individual firm, such as research and development (R&D) achievements and industrial relations problem. The relevant measure of the risk of an asset is its contribution to the systematic risk of an investor's portfolio defined by its beta rather than the inherent variance in the asset's total return.

If the beta of an asset is larger (smaller) than 1, then the standard deviation of an asset changes more (less) than proportionately in reaction to changes in market conditions. Thus, an asset whose beta is greater (less) than 1 has a relatively greater (smaller) contribution to the risk of a portfolio. While beta does not measure risk in absolute terms, it is a crucial risk indicator, reflecting the extent to which the return on the single asset moves with the return on the market.

Assumptions of the CAPM

The CAPM rests on several assumptions. The most important are as follows:

a) All investors are rationally risk-averse individuals whose aim is to maximize the expected utility of their end of period wealth. Therefore, all investors operate on a common single-period planning horizon.
b) All investors are price-takers; so that, no investor can influence the market price by the scale of his or her own transactions.
c) Asset markets are frictionless and information is freely and simultaneously available to all investor.

d) All investors have homogeneous expectations about asset returns, this mean that all investors arrive at similar assessments of the probability distribution of returns expected from traded securities. This says that investors will not be trying to beat the market by actively managing their portfolios Distributions of expected returns are normal. All securities are highly divisible, i.e. can be traded in small packages. All investors can lend or borrow unlimited amounts of funds at a rate of interest equal to the rate of risk-free securities. Investors pay no taxes on returns and there are no transaction costs entailed in trading securities, so expected return is only related to risk.

The Market Portfolio

The market portfolio is a portfolio that consists of all securities where the amount invested in each security corresponds to its relative market value. Under these assumptions of the CAPM each investor hold an optimal portfolio and the aggregate of all investors is the market portfolio, which is defined as the portfolio of all risky assets, where the weight on each asset is simply the market value of that asset divided by the market value of all risky assets. In theory, market portfolio consist of all risky assets in the world including financial assets, real estate, human capital and the like, which exists in all the countries of the world.

Moreover, the CAMP requires that in the equilibrium the market portfolio must be an efficient portfolio. One way to establish its efficiency is to argue that if investors have homogenous expectations, the set of optimal portfolios they would face using the same values of expected returns, variances and co variances. Therefore, the efficiency of the market portfolio and the CAPM are joint hypothesis and it is not possible to test the validity of one without the other (Roll, 1977). If a market is weak form efficiency, then it is impossible to earn abnormal returns by developing a forecasting model based on past returns. In the context of the capital asset pricing model, an abnormal return in excess of what was expected according to the CAPM equation.

Restrictions and Extensions of the CAPM

Although not all of the assumptions underlying the derivation of the CAPM conform to reality, they are simplifications that permit the development of the CAPM. However, it is important to realize that most of these assumptions are merely mathematical identities and they do not reflect or predict the behaviors of investors. As a consequence, while on the surface the capital asset pricing model appears to be rich in economic content and predictive power, it really makes only one interesting economic prediction: All investors hold portfolios that are on the efficient set, and as a result the market portfolio is itself on the efficient set.

However, most individuals and many institutions hold portfolios of risky assets that do not resemble the market portfolio. Therefore, the incorporation of more realistic assumptions into the model may get better insight into investor behavior. Alternative versions of the CAPM have been derived to take into account some of the problems such as the non-existence of a risk-free asset or the imposition of some frictions involving the risky or risk-free assets.

Empirical Tests of the CAPM

When the CAPM is empirically tested, the theoretical CAPM is transformed to the model presented below that involves running a regression. The characteristic of this model is it cannot have a negative slope.

$Ri - R\,f = a + bi + \epsilon\ I$…………………………………… (2.3) (Litzenberger and Ramaswamy, 1979).

If the CAPM is correct, then results should find that:

a) The intercept a should be Zero
b) The slope coefficient b should equal (Rm-R f),
c) The relationship should be linear in beta.

2.2.2 The Arbitrage Pricing Theory

The Arbitrage Pricing Theory (APT) is another model of asset pricing based on the idea that equilibrium market prices should be perfect, in such a way that prices will move to eliminate buying and selling without risks (arbitrage opportunities).

The basis of this theory is the analysis of how investors construct efficient portfolios and offers a new approach to explaining the asset prices and also states that the return on any risky asset is a linear combination of various macroeconomic factors that are not explained by this theory. Therefore unlike CAPM model this theory specifies a simple linear relationship between assets, returns and the associated k factors. There are two empirical testable versions of the APT, the statistical APT and the macro variable APT. However, the macro variable model differs from the statistical factor model mainly because the factors are specified in advance and they are interpretable.

The APT equilibrium rests on investors' ability to construct an arbitrage portfolio by simultaneously holding a short and a long position in two different portfolios which offers positive expected return with zero risk and zero net investment. Asserted risk-expected return relation is known as the Arbitrage Pricing Theory, Which is formulated by Ross (1976).

The Derivation of the APT

The APT can be seen as a multi-factor model in which the returns generating process of the portfolio is a function of several factors. Such a model specifies a simple linear relationship between asset *I*'s returns and the associated *k* factors, which influence its returns, and takes the general form:

$$Ri = E (Ri) + \Sigma\ jij + \epsilon\ I \qquad (2.4)$$

Where,

Ri: The random rate of return on security *i* at the end of the period, *i* = 1… n

E (Ri): The expected Rate of return on security I at the beginning of the period,

j: The Zero mean *j*th factor common to the return of all assets under consideration,

ij :The ith security's return to the *j*th common factor or asset *I*'s factor loading f or factor j,

Є *i:* A random Zero mean noise term for security *i*.

The model says that, at the end of the period asset *I*'s realized return is a linear combination of its expected return, plus realized factor returns, with asset *I*'s specific factor loadings weighted, plus asset *I*'s specific risk component. This is assumed for all assets, *i* = 1…n. The theory requires that the number of assets under consideration, n, be larger than the number of factors, *k*, and the noise term, *i*, be the unsystematic risk components of risk. The derivation was based on the intuition that in an efficient market, and consistent with market equilibrium, not risk-free arbitrage profit opportunities can exist and only a few common factors are priced for large, well-diversified portfolios. The resulting pricing relation expressed the expected return on an asset *i* in a linear relationship with the k-factor risks follow:

E (Ri) = λ0 + Σ λ jij ………………… …. (2.5) (Roll and Ross, 1980)

Where,

λ0: Expected return on an asset with zero systematic risk,

λj: Risk Premium for the *j*th factor in equilibrium.

Assumptions of the APT

Asset markets are perfectly competitive and frictionless; all investors have homogeneous expectations that returns are generated randomly according to a k-factor model (equation 2.3). Investors have monotonically increasing concave utility functions; the number of assets existing in the capital market from which portfolios are formed is much larger than the number of factors. There are no arbitrage opportunities. (Because their is no arbitrage conditions holding for any subset of securities, it is unnecessary to identify all risky assets or a market portfolio to test the APT) There are no restrictions on short selling. (This assumption is crucial to the equilibrium, as it constitutes one side of the arbitrage portfolio; equally important is the requirement that the proceeds from short selling are immediately available.)

Empirical Tests of the Arbitrage Pricing Theory

There are two empirically testable versions of the APT, the Statistical APT and the Macro variable APT. The Statistical APT first tested by Roll and Ross (1980) involves identifying priced common risk factors and this version of the APT is also known as the factor-loading model.

The Number of Risk Factors in the APT

After the initial development of the APT by Ross (1976), the first empirical test of the model is done by Roll and Ross (1980), who use a two-step testing procedure. They examine daily data on 42 groups of 30 securities for the period 1962-72. They employ the maximum likelihood factor analysis to estimate the expected returns and the factor coefficients from time series data on individual asset returns. Then, they use these estimates to test a cross-sectional pricing relationship. They found that at least three but not more than six factors were significant in explaining most of the joint variability in the returns on this group shares.

Dhrymes, Fried and Gultekin (1984) re-examined the techniques employed by Roll and Ross (1980) and point out several limitations. First of all, they note that the results for a small portfolio differ from the results for a large portfolio. Second, they assert that the methodology that RR (1980) uses for determining confirmatory evidence about the number of factors is not appropriate. They find that as the number of securities increases, the number of factors determined also increases, at a 5% level of significance, they find two factors for a group of 15 securities, three factors for a group of 30 securities, four factors for group of 45 securities, six factors for group of 60 stocks, and nine factors for a group of 90 securities.

Kryzanowski (1983) has tested the assumption that security returns are characterized by an explicit underlying factor structure. They use US and Canada stock price data to test the APT. Their study concludes that the number of relevant factors is an increasing function of the size of the group being factored. They observed that while five factors are sufficient to represent the US security returns, Canadian securities required 18-20 factors.

Roll and Ross (1980) emphasized on “one would expect the number of factors to increase with the sample size because one would expect more potential relationship to arise among the stock but the important point is how many factors are significantly priced by the market in a diversified portfolio".

Cho, Elton and Gruber (1984) support the Roll and Ross study by examining the number of factors in return-generating process that are priced. They note that there are definitely more priced factors influencing stock returns than implied by the CAPM. By employing the same factor analysis, they found five priced factors.

Chen, Roll and Ross (1986) test the APT by using macroeconomic data series to explain stock returns. They employ seven macroeconomic variables as the source of systematic risk according to the dividend discount model, which assumes that prices of assets are determined through their expected discounted dividend payments. These variables are industrial production, inflation, risk premium, term structure, market returns, consumption and oil price especially for a country such as Nigeria. Their evidence suggests that consumption; the financial market does not price oil prices and the market index. They note that the market returns explain much of the movements in portfolios but the market betas do not explain cross-sectional differences after the betas of the state variables are included. They concluded Stock returns are exposed to systematic news, that they are priced in accordance with their exposures, and that the news can be measured as innovations in state variables whose identification can be accomplished through simple and intuitive financial theory.

2.2.3 Comparing the CAPM and the APT

In comparison Ross (1976) argues that the APT is substantially different from usual mean variance analysis and constitutes a related by quite distinct theory. He suggests there are two main differences between these two models in comparison. First, instead of the explicit modeling of the factors affect actual and expected returns of assets in APT; CAMP focuses on the market portfolio. Second, the fact that in the APT the equilibrium relationship is derived based on a no-arbitrage assumption. Proponents of the APT argue that the APT was superior to the original CAPM in regard to the following arguments. While both theories make the realistic assumption that investors prefer more wealth to less and that they are risk averse, the quadratic utility assumption of the original CAPM is much more restrictive. The APT dose not requires the assumption of multivariate normal distribution of returns. The APT dose not require the existence of the market portfolio therefore the difficulties such as identification of the market portfolio or a suitable proxy and the requirement that it be mean-efficient, are avoided. The APT does not require the existence of risk-free asset and a risk less rate at which lending and borrowing are undertaken.

Stock Returns and Macroeconomic Variables

Different studies have shown the expected and actual stock market returns. One of these major studies analyzed the relationship between the stock market and macroeconomic variables. These present value models asserts that stock prices are determined by the discount rate and dividends, and are thus influenced by macroeconomic variables that influence dividends or the discount rate and proxies. Inconsequentially, the systematic force that has an influence on the stock prices, and returns, are those that control the discount rate factor or dividends. McQueen and Roley (1993) and Jarvinen (2000) studied the impact of macroeconomic news on the stock market conditioned on the state of the economy for the US and Finland correspondingly. They argued that during a depression, a higher unexpected economic growth might indicate the end of the recession, which influences the stock market positively. Alternatively, higher than expected economic growth in an growing economy might bring about fears of an overheating economy, which might prompt monetary authorities to raise the interest rates and thus be bad news for the stock market. Their results were supportive of asymmetric relationships between the stock market and macroeconomic variables conditional on the state of the business cycle. Most studies on the modeling of stock prices or stock returns use data for developed countries.

Fifield, Power and Sinclair (2002) have tested the influence of domestic variables (GDP, money supply inflation, short term interest rate, exchange rate and trade balance) as well as global variables (world industrial production, world return, oil price US interest rates world inflation and commodity prices) using cross sectional data for thirteen emerging markets in explaining the stock market. Their results showed that interest rates domestic GDP, money supply and inflation as well as the world production and inflation, can explain the variability in equity returns in upcoming markets. The significance of these factors is that they vary between countries. The results highlighted the importance of empirically modeling the emerging stock markets. The NSM, which functions in an emerging economy, will be determined by different factors that affect stock markets in developed countries.

Probably the relationship between stock prices and macroeconomic variables is well illustrated by Miller and Modigliani (1961) using Dividend Discount Model (DDM) than any other theoretical stock valuation model. According to the model the current prices of an equity share is equal to the present value of all future cash flow to the share. Therefore any economic factors which influence the expected future cash flow and required rate of return in turn influence the share. Arbitrage price theory by Ross (1976) hypothesizes the relationship between stock prices and certain macroeconomic variables. Since the fundamental value of stocks equals the expected present value of the firm's future dividends, stock price (return) performance is expected to be a product of the features of macroeconomic factors. In literature; real activity (GDP), interest rate, money supply, and inflation are considered as the main factors affecting the behavior of the stock market. Due to the expected positive impact of real economic activity on the firm's future profits and consequently on its future dividends, GDP is expected to exert a positive impact on stock return (Fama, 1981).

2.3 The Empirical review

2.3.1 Review of international literature

Mayasami et al. (2004) in their research paper tried to show the relationship between macroeconomic variable and stock price. The researchers examined the long-term equilibrium relationship between selected macroeconomic indicators and Singapore stock market index as well as with various Singapore exchange sector indices – the finance index, the property index, and the hotel index. The macroeconomic variables considered for the study were interest rate; inflation, exchange rate; industrial production and money supply. And the other stock market indices considered for the study were The SES ALL-S equities finance index, The SES ALL-S property index and the SES-S hotel index.

The study was conducted through cointegration of macroeconomic variables and the stock price indices. Here, cointegration refers to the long term relationship between different variables .The study concluded that the stock market indices and property index had significant relationship with all the macroeconomic variables used in the study while equities finance and hotel indices had significant relationship with only few variables. The study revealed for equities finance index, real economic activity and money supply were not significant and in the case of hotel index, money supply and short and long term interest rate were found to be insignificant.

Rashid (2008) in his article tried to investigate the dynamic interactions between four macroeconomic variables and stock price in Pakistan using cointegretion and Granger Causality test. The analysis covers the sample period from 1994 to 2007. The results from the analysis strongly suggests cointegretion between the stock price and macroeconomic variables viz. consumer prices, industrial production , exchange rate and market rate of interest.

The result also provides some evidence that the stock price Granger caused by changes in interest rate in the short run. However the analysis is unable to explore any short run causation between the stock price and the remaining three macroeconomic variables. It may therefore be stated that the association between the health of the stock market in the sense of rising share price and health of the economy is a long run phenomena.

Shiblee (2009) in her research paper tried to analyze the determinants of stock price by taking GDP, unemployment, Money supply and inflation as independent variable and stock price itself as dependent variable and reached the following conclusions :

The strongest variable effect among his collection was Money supply. It has strong positive influence on the most companies in his sample. She suggested that the researcher could depend on his variable for forecasting the stock price.

The second variable was CPI, it had strong effect on most of the companies but its effect has unlimited direction (positive and negative). She suggested that this variable must be studied with one another to be able to determine the effect on stock price. As for inflation and unemployment, both have weak influence on most of the companies.

Govati (2009) in his article tried to examine the relationship between the stock returns and macroeconomic variables viz. Broad money supply(M_2), exchange rate(XR), interest rate (IR) and industrial production using the data for the period 1996 to 2006. He employed the GARCH model for the analysis and conducted unit root test to check the stationary of the data. He found that not all the macroeconomic factors have similar effects on stock returns on the Malawi stock exchange. Specifically, the study has found that the volatility is persistent and it dies down slowly and factors affecting this volatility are money supply, exchange rate and industrial production. And interest rate shows asymmetric effects on stock price.

Imran et al. (2010) in their research paper have tried to analyze the relationship between macroeconomic indicators and stock price index in Pakistan. They have used the data from June 1990 to December 2008 for the analysis. The macroeconomic indicators considered for analysis were inflation, exchange rate, balance of trade and index of industrial production. The researcher has tried to find out the casual relationship between these macroeconomic indicators with general price index of Karachi stock exchange, a largest stock exchange in Pakistan. This study was conducted with a purpose to answer the questions: Whether or not the stock performance is a valid indicator to reflect macroeconomic conditions in the economy? Whether or not the macroeconomic indicators can be used to predict stock price in Pakistan? For analyzing this researcher have used statistical tools like unit root test, augmented dickey fuller test, Johansen's co integration test, Grangers' causality test on secondary data collected from monthly bulletins of federal bureau of statistics of Pakistan.

This study did not find any casual relationship between the macroeconomic variables and stock price in Pakistan. This means the macroeconomic indicators cannot be considered as a tool for predicting stock price and stock price of Pakistan do not reflect the economic condition of a Country. The researchers compared the result with the similar study that is conducted in 2004 by Nihat and Shaheen whose findings were contradictory to that of current findings.

Abdulrahim (2011) in his article has tried to investigate the relationship between Nigerian stock returns and changes in the number of macroeconomic variables namely – inflation, interest rate, oil production, exchange rate and money supply using APT model. He found that the short term interest rate (STIR), money supply(M_2), consumer price index rate have statistically significant influence on Nigerian stock return. It also found that there is a significant negative relation between STIR, CPI and stock market returns whereas M_2 has a positive impact on the stock market returns. The model suggests the relationship between OPI and stock returns which is very important for Nigerian economy, because the economy is mostly based on the oil production to survive. However this variable was found insignificant.

Khan (2012**)** in his article tried to analyze the determinants of share price by taking the variables GDP growth rate , interest rate, dividend per share, bank to market ratio(B\M), price earning ratio as independent variables and share price as a dependent variable and reached the following conclusions:

a) The rise in GDP growth rate, dividend and price earning ratio will leads to rise in share price.
b) Bank to market ratio (B\M) and interest rate are negatively related to share price.
c) B\M ratio and interest rates have negative impact on share prices i.e. they move in opposite direction.

2.3.2 Review of National Literature

Stock market in Nepal is still in nascent stage and there are limited books, journals and studies conducted on this subject matter. Only a few researches have been conducted to find out the relationship between macroeconomic variables and stock market of Nepal. Some of the related studies are presented here:

Acharya (2009) conducted a research with a purpose to analyze the role of stock market in saving mobilization, capital formation, investment acceleration and economic growth of the country. For analysis, market capitalization, total value traded, turnover and volatility were used as stock market variables and GDP as economic growth variable. The researcher had conducted regression and trend analysis of fourteen year data for drawing the conclusion of the study. The result of the study showed positive relationship between stock market variable and GDP. This means that growth of stock market in Nepal has positive impact on the growth rate of the economy of the country. The researcher has identified absence of operational efficiency in the market and suggested that development of stock market be prioritized for the development of overall economic development.

Joshi (2009) has tried to analyze the stock market development of Nepal. He has focused the size, liquidity, volatility, and concentration to determine the performance of NEPSE and then he has analyzed the relationship between development of stock market and economic growth. The study was based on 14 years secondary data from 1993\94 to 2006\07. The study has pointed out that secondary stock market in Nepal is very small but has an increasing trend. It has also pointed out that Nepalese stocks are highly volatile and is highly concentrated in banking sector. In case of primary stock market the researcher opines that it is in a poor state but gradually improving. The researcher has identified that annual turnover, market capitalization, number of listed and traded companies , market capitalization to nominal GDP and NEPSE index are fluctuating in nature but also has pointed out that these indices are gradually improving . This study has also showed the positive relationship between stock market variables and economic growth implying that stock market has positive contribution on economic development.

Dhamala (2004) has analyzed the importance of Nepalese stock market development for economic growth. The main focus of her study is to analyze the trend of stock market in Nepal to analyze the role of stock market in economic growth and to determine the relationship between stock market indicators and indicators of economic development. In the study economic growth is measured by GDP in real terms, real investment, real savings, population growth rate and discount rate. And the development of stock market is measured by the size of stock market, liquidity, concentration and volatility. Thus study covered the period of 1993\94 to 2004\05. In the study, descriptive as well as quantitative methods were used for the analysis. She has concluded that the stock market in Nepal is highly liquid and risky due to low market capitalization and value traded rate. Apart from this, her regression and correlation suggested that only market capitalization has significant relation with GDP, which indicates that Nepal stock market is in an underdeveloped stage. In other words various measure of stock market development and various statistical analyses indicate that the stock market in Nepal is underdeveloped and has failed to show the impact on overall national economy.

Jha (2010) in his research paper tried to explain the relation between stock market development and economic growth by taking GDP, saving, investment, capital formation, value traded, turnover, volatility, and market capitalization as the variables. For the analysis, he took the secondary data for the year 1993\94 to 2007\08. His statistical analysis found that stock market in Nepal is highly illiquid and risky. Apart from these regression and correlation results suggested that stock market variable influences Nepalese economy positively but by small amount .In addition; result revealed that Nepal stock market is in an underdeveloped stage. Investors usually try to avoid investing in stock market because they do not have much option to invest in securities according to their risk return preferences. Similarly firms ignore the stock market because stock market is less reliable source of raising fund for them.

2.3 Conclusions

The international review in section 2.2.1 showed that there are lots of works done on the relationship between macroeconomic variables like inflation rate, industrial production, fiscal deficit, exchange rate etc. And the result of each paper varies with that of other. They have used various models to explain the relationship Granger causality test, Johansen multivariate cointegretion technique etc to explain the relationship. However ARDL technique seems to have edge over other methods in analyzing the relationship between stock market and economic development over other methods. The national review in 2.2.2 showed that there are a few research work done to find out the relationship between macroeconomic variables and stock price. So, this is my attempt to find the relationship with the help of ARDL model to cointegretion analysis purposed by Pesaran and Shin (1999).

Chapter 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology used in this study. This methodology presents both cointegretion and error correcting model to investigate the relationship between NEPSE and Macroeconomic variables (its determinants). Section 3.2 presents the estimation of NEPSE equation. Section 3.2.1 presents the empirical model and variables details. Section 3.2.2 discusses the ARDL modeling to cointegreting analysis. Section 3.2.3 presents the hypothesis; section 3.3 provides the discussions on various econometric tools and tests used in the study.

3.2 Estimation of NEPSE Equation

The variables included in this study are chosen on the basis of theory as well as in keeping with empirical evidence drawn from previous studies which used similar variables in their quest to find the relationship between stock prices or stock returns and macroeconomic variables. For instance, Chen et al. (1986) used interest rate, inflation and industrial production; Kandir (2008) used money supply, CPI, growth in crude oil prices, exchange rate and interest rate. Ali (2011), Masinghe (2006), Bilson et al (1996) used CPI, exchange rate, Money supply (M1) and GDP. Similarly, Sahu & Dhimal (2011), Ahmed (2008), Tripathy (2011) study of Indian markets used Industrial production, Exchange rate and inflation index.

So far the relationship between macroeconomic fundamentals and the stock market volatility seem to be inconclusive, since different empirical studies have found different or mixed results

3.2.1 The Empirical Model

Following the different literature, the study has employed following model to measure the relationship between NEPSE and macroeconomic variables.

$$Nepse=\alpha+\beta_1 Inf+\beta_2 Ygt+\beta_3 M_{2+}\mu_t \qquad \text{..................................} \quad (3.1)$$

Where,

μ_t is the white noise error term.

The details of all the variables used in the formulation of equations (3.1) and used in this study have been presented below:

Variables Name	Details
Inf	Expected rate of inflation defined by Inf=100*Δlog CPI. CPI is the Consumer's price index.
Ygt	Ygt is the real GDP growth rate defined by, $Ygt=100*\Delta logY_{t.}$ Y_t is the real GDP calculating by deflating real GDP by GDP deflator (FY 2005/06).
M_2	Real broad Money supply defined by Broad money supply adjusted by CPI (FY 2005/06).
Nepse	NEPSE refers to Nepal stock exchange rate.

3.2.2 Estimation Methodology

When traditional Ordinary Least Square (OLS) is run then it is assumed that data are stationary on the levels. However, in most of the cases, time series data are not stationary rather these are non-stationary on the levels. If OLS method is run for non-stationary variables then the relationship may be spurious. However if they are co integrated then the parameters will not be spurious rather will be super consistent. Existence of co integration implies that variable in the model are integrated of same order and error terms are stationary, in which case the model defines the long-run equilibrium relationship among the integrated variables.

There are various techniques for conducting the co integration analysis among the macroeconomic variables. The popular approaches are: the well-known residual-based approach proposed by Engle and Granger (1987) and the maximum likelihood-based approach proposed by Johansen and Juselius (1990) and Johansen (1991), Gregory and Hansen (1996). All these require that the variable in the system be of equal order of integration. The residual based cointegration are inefficient and can lead contradictory results, especially when there are more than two I (1) variables in the model.

To overcome these problems Pesaran and Shin (1999), Pesaran and Pesaran (1997) and Pesaran et al. (1996) have introduced an alternative technique to co integration known as "Autoregressive Distributed Lag (ARDL)" model or ARDL bond testing. ARDL model is preferable over conventional techniques like Engle and Granger and Johansen co integration techniques as it does not require the classification of variables into I(0) or I(1). So, adopting the ARDL approach for co integration test, there is no need to conduct the unit root test, which is prerequisite for residual-based and maximum likelihood based approach. The second advantage of using ARDL approach is that it can provide better results for small sample than other techniques of co integration. For these advantages, ARDL approach has gained popularity over recent years and its adoption for empirical analysis on economic growth models can be found in many published works.

This study follows the Auto Regressive Distributed Lag Model (ARDL) as proposed by Pesaran et al. (`1996). There are many advantage of this approach. First, it can be applied on a time series data irrespective of whether the variables are I(0) or I(1) (Pesaran and Pesaran, 1997). Second, it is robust in small sample study (Pesaran et al., 1996). Third, it takes sufficient numbers of lags to capture the data generating process in a general-to-specific modeling framework (Laurenceson and Chai, 2003). It has stated that a dynamic Error Correction Model (ECM) can be derived from ARDL through a simple linear transformation. The ECM integrates the short-run dynamics with the long run equilibrium without losing long-run information.

A) Autoregressive Distributed Lag Model (ARDL) to Co integration Analysis

ARDL model to co integration analysis is proposed by Pesaran and Pesaran (1997), Pesaran and Shin (1999). Pesaran et al. (1996) has further extended the ARDL model to co integration. Due to the low power and other problems associated with other methods for co integration test, the ARDL approach to co integration has become popular in recent years. The ARDL co integration approach has numerous advantages in comparison to other co integration methods such as Engle and Granger (1987), Johansen and Juselius (1990) techniques:

(i) ARDL procedure does not require the unit root pretesting of the variables in the model unlike other techniques such as Johansen model. It is applicable irrespective of whether underlying regressors are purely I (0), purely I (1) or mutually co integrated but the limitation of the model is that, the procedure will collapse in the presence of I (2) series.

(ii) ARDL approach provides more significant result of co integration in small samples than other conventional techniques.

(iii) ARDL procedure allows that the variables may have different optimal lags, while it is impossible with conventional co integration procedures.

(iv) Once the orders of the lags in the ARDL model have been selected, the cointegration relationship can be estimated using a simple OLS method.

(v) ARDL technique generally provides unbiased estimates of the long-run model and validates the t-statistics even when some of the regressors are endogenous.

(vi) The short-run as well as long–run parameters of the models could be estimated simultaneously.

(vii) The ARDL procedure employs only a single reduced form equation, while the conventional co integration procedures estimate the long-run relationships within a context of system equations. (viii) ARDL also can provide the information about structural break in the time series.

Following the Pesaran et al. (1996), an ARDL representation of equation (3.2) can be written as:

$$\Delta Nepse = \gamma_0 + \sum_{j=1} \gamma_{1j} \Delta Nepse_{t-1} + \sum_{j=1} \gamma_{2j} \Delta Inf_{t-1} + \sum_{j=1} \gamma_{3j} \Delta Ygt_{t-1} + \sum_{j=1} \gamma_{4j} M_{2\,t-1} + \delta_1 Nepse_{t-1} + \delta_2 Inf_{t-1} + \delta_3 Ygt_{t-1} + \delta_4 M_{2t-1} + \mu_t \quad \ldots \qquad (3.2)$$

Where, Δ is the first difference operator, γ_0 is drift component. The coefficients: δ_1, δ_2, δ_3, δ_4, δ_5 and δ_6 represent the long-run relationship and γ_1, γ_2, γ_3, γ_4, γ_5 and γ_6 represent the short-run dynamics of the model. μ_t is the usual white noise residual.

3.2.3 Hypothesis

In order to examine the existence of long-run relationship among the variables in the system, the study has employed the bound test approach developed by Pesaran et.al. (2001). The bound test is based on the Wald test or F-statistic. To test the long-run relationship between the variables, the hypothesis is:

Null hypothesis (H_0): $\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0$ i.e. there is no co integration or long-run relationship.

Alternative hypothesis (H_1): $\gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq 0$ i.e. there exists long run relationship between the stock prices and its determinants.

Above null hypothesis (H_0) of no relationship has to be tested against the alternative hypothesis by means of F-test. The asymptotic distribution of the F-static are non standard irrespective of whether the variables are I(0) or I(1). Pesaran et al. (2001) have provided the two sets of critical values. The lower critical bound assumes that all the variables in the ARDL model are I(0) and upper critical bound assumes I(1). If the calculated value of F-statistic is greater than upper critical valu0e of bound, then the null hypothesis of no co integration is rejected. If such statistics is below the lower critical value of bound, the null hypothesis cannot be rejected. Finally, if it lies within the lower and upper bounds, the result would be inconclusive.

The estimation of the long-run relationship is based lag selection criteria such as adjusted R^2, Schwarz Bayesian Criterion (SBC), Akaike Information Criterion (AIC) and Haann Quinn (HQ) Criterion. Based on the long-run coefficients, the dynamic error correction model (ECM) has also employed for the short-run dynamics of the model. Thus, the error correction version of the ARDL model is:

$$\Delta Nepse = \gamma_0 + \sum_{j=1} \gamma_{1j} \Delta Nepse_{t-1} + \sum_{j=1} \gamma_{2j} \Delta Inf_{t-1} + \sum_{j=1} \gamma_{3j} \Delta Ygt_{t-1} + \sum_{j=1} \gamma_{4j} M_{2\,t-1} + \lambda ECM_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

In the above equation (3.3), the coefficients of the lag variable i.e. γ_1, γ_2, γ_3, γ_4, γ_5 and γ_6 provide the short-run dynamics of the model. Λ is the speed of adjustment parameter ECM and shows the divergence/convergence towards the long-run equilibrium. Positive value of λ indicates divergence and negative value indicates convergence. ECM is residual which is obtained from the estimated co integration model of equation (3.3). The error correction term (ECM) is thus defined as; ECM_t = Nepse– φ_1 Inf_t – $\varphi_2 M_2$ – φ_4Ygt,

Where,

$\varphi_{1}= -\frac{\delta 2}{\delta 1}$, $\varphi_2 = -\frac{\delta 3}{\delta 1}$, $\varphi_{3}= -\frac{\delta 4}{\delta 1}$, are the OLS estimates obtained from equation (3.3).

3.3 Econometric Tools

3.3.1 Time Series Properties of the Variables

A time series is said to be stationary if their mean, variance and auto covariance remains the same no matter at what point they are measured i.e. they are time invariant. Such a time series will tend to return to its mean and fluctuations around this mean will have broadly constant amplitude. If a time series is not stationary, it is called non stationary time series (Gujarati and Sangeetha, 2007).

If a time series is stationary at level it is called time series integrated of order zero or I (0) process. A time series is said to be integrated of order one I (1) process if it is not stationary at levels but stationary at first difference. In general a time series is said to be integrated of order d denoted by I (d), if it has to be differentiated d times to get a stationary series.

Most economic time series are generally I (1) i.e. They generally become stationary only after taking the first differences (Granger, 1986).

3.3.2 Cointegration

When traditional ordinary least square is run then it is assumed that the data are stationary at all levels. However in most of the cases time series data are not stationary rather they are not stationary on all levels. If OLS method is run for non - stationary variables then the relationship may be spurious. However if they are co integrated then the parameter are not spurious rather will be super consistent. The concept of co integration has first introduced by Granger (1981) and Engle and Granger (1987). In the case where the variables are non stationary at levels but are difference stationary, co integration method always allows researcher to test the presence of long run equilibrium relationship between economic variables. If the separate time series data are stationary after differencing or they are integrated of order one, but a linear combination of their levels is stationary, then the time series are said to be co integrated. In other words two or more I (1) time series are said to be co integrated if some linear combination of them is stationary.

Test for co integration seeks to discern whether or a stable long run relationship exists among such a set of variables. The existence of common will drive the behavior of the variables. Shocks that are unique to one time series will die out as the variables adjust back to their common trend. The long run relationship of the Nepse and variables is presented below:

Nepse = $\varphi 1$ $Inf_t - \varphi_2 M_2 - \varphi_3 Ygt + \mu_t$.. (3.4)

Where,

$\varphi_{1=} - \frac{\delta 2}{\delta 1}$, $\varphi_2 = - \frac{\delta 3}{\delta 1}$, $\varphi_{3=} - \frac{\delta 4}{\delta 1}$,

3.3.3 Error Correction Modeling:

Even if Y (t) and X (t) variables are co integrated i.e. there is long run equilibrium relationship between them, there may be disequilibrium is short run. Thus the error term u(t)=Y(t)- β1- β2X(t) in the regression equation Y(t)= $\beta_1 + \beta_2$ X(t)+u(t) is called equilibrium error. This error term can be used to tie the short run behavior of Y (t) to its long run value. The error correction models are developed by Pesaran and Pesaran (1997) and later popularized by Engel and Granger corrects the disequilibrium.

The error correction term (ECM) is thus defined as; ECM_t = Nepse– φ_1 $Inf_t - \varphi_2 M_2 - \varphi_3 Ygt$ ………………………………………………….. (3.5)

Where,

$\varphi_{1=} - \frac{\delta 2}{\delta 1}$, $\varphi_2 = - \frac{\delta 3}{\delta 1}$, $\varphi_{3=} - \frac{\delta 4}{\delta 1}$, are the OLS estimates obtained from equation (3.3).

3.3.4 Diagnostic Tests and Other Tests

(i) JB test for Normality:

Jarque Bera (JB) test for normality is an asymptotic large sample test based on OLS residuals. The test statistics is defined by

$$JB = \frac{n}{6}\left[S^2 + \frac{(k-3)^2}{4}\right]$$

Where n = sample size, S = Skewness coefficient, K = kurtosis coefficient. For a normally distributed variable, S = 0 and K = 3. Therefore, the JB test for normality is a test of joint hypothesis that S and K are 0 and 3 respectively. In that case, the value of the JB statistic is expected to be zero. Under the null hypothesis that the residuals are normally distributed, Jarque and Bera showed that asymptotically the JB statistic follows the chi-square distribution with 2 degree of freedom. If the computed p-value of the JB statistic is sufficiently low or the value of the statistic itself is different from zero, the null hypothesis that the residuals are normally distributed is rejected. On the contrary, if the p-value is reasonably high or the value of the statistic is close to zero, the normality hypothesis is not rejected (Gujarati and Sangeetha, 2007).

ii) LM Test for Serial Correlation

In the models which contain lagged values of the regressand, the Durbin-Watson d-statistic is often around '2' implying that there is no first order autocorrelation. Thus, there is a bias against discovering first order autocorrelation in such models. This does not mean that autoregressive models do not suffer from autocorrelation problem. To solve this problem, Durbin has developed Durbin h-test but it is less powerful in statistical sense than the Breusch-Godfrey test popularly known as the LM test for serial correlation. The LM test allows for the lagged values of the regresand, higher order autoregressive scheme and simple or higher order moving averages of the white noise error term.

The null hypothesis under this test is:

H_0: $\rho_1 = \rho_2 = \rho_3 = \ldots\ldots \rho_p = 0$ i.e. there is no serial correlation of any order.

Where u_t follows the p^{th} order autoregressive, AR (p), scheme as follows:

$u_t = \rho_1 u_{t-1} + \rho_2 u_{t-2} + \ldots\ldots\ldots + \rho_p u_{t-p} + \varepsilon_t$ ....(3.6)

Test statistic is given by

$(n-p)R^2 \sim X^{p2}$

Where the R^2 is calculated from the auxiliary regression equation given by

$\hat{u}_t = \alpha_0 + \alpha_i X_{ti} + \hat{\rho}_1 \hat{u}_{t-1} + \hat{\rho}_2 \hat{u}_{t-2} + \ldots\ldots\ldots + \hat{\rho}_p \hat{u}_{t-p} + \varepsilon_t$

Where X_{ti} are explanatory variables

For large sample, this statistics follows the chi-square distribution with 'p' df. If (n-p) R^2 exceeds the chi-square critical value at the chosen level of significance in which case null hypothesis is rejected that is to say there is the presence of serial correlation of some order.

iii) Ramsey's RESET Test

This test is the regression specification error test (RESET). It is used to check whether the specified functional form is correct or not.

The procedure for F-Version is as follows:

Let the simple regression model is

$Y = \alpha_1 + \alpha_2 X + u$ .... (3.7)

From equation (3.7), $\hat{Y}$ is found and the following regression is run by adding $\hat{Y}$ in some form as an additional regressors starting with $\hat{Y}^2$, e.g.

$Y = \beta_1 + \beta_2 X + \beta_3 \hat{Y}^3 + u$ .... (3.8)

Let the R^2 obtained from equation (3.7) is R^2_{old} and that from Equation (3.8) is R^2_{new}. Then the following F statistics is constructed:

$$F = \frac{(\text{R2new} - \text{R2old}) / \text{number of new regressors}}{(1 - \text{R2new}) / (n - numbers\ of\ parameters\ in\ the\ new\ model}$$

If the computed F value is found significant, say, at 5%, one can accept the hypothesis that the model is miss-specified.

Alternative to F-version is the LM version where the calculated statistic nR^2 follows the chi-square distribution with df equal to the number of restrictions imposed for large samples. If the calculated value exceeds the critical value of X^2 at the chosen level of significance, the null hypothesis is rejected and concluded that the model is miss-specified.

iv) Model Selection Criteria

Model selection criteria are used to choose a model from the alternative models.

. **Adjusted R^2 criterion**

It is calculated as:

$$\bar{R}^2 = 1 - \frac{RSS/_{n-k}}{TSS/_{n-1}}$$

Where,

RSS = residual sum of square

TSS = total sum of square

n = number of observations

k = number of parameters in the regression model

On the basis of this criterion, a model with highest $\bar{R}^2$ is chosen.

Akaike Information Criterion (AIC)

AIC is calculated as:

$$AIC = e^{2k/n} * \frac{RSS}{n}$$

Where, k = number of parameters,

It can also be writes as:

In AIC = 2k/n + 1n (RSS/n)

Where, 1n = natural logarithm and 2k/n is the penalty factor.

AIC imposes harsher penalty than $\bar{R}^2$ for adding more regressors. In comparing the models, the lowest value of AIC is preferred.

Schwarz Bayesian Criterion (SBC)

SBC is calculated as:

$$SBC = \frac{k}{n} . 1n\ n + 1n\ (\frac{RSS}{n})$$

Here, $\frac{k}{n}$. 1n n is the penalty factor. So SBC imposes a harsher penalty than AIC. Like AIC, lower value of SBC is preferred.

v) CUSUM Test and CUSUMSQ Test

CUSUM Test

The CUSUM test (Brown, Durbin, and Evans, 1975) is based on the cumulative sum of the recursive residuals. This option plots the cumulative sum together with the 5% critical lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines.

The CUSUM test is based on the statistic

$$W_t = \sum_{r=k+1}^{t} Wt/s$$

For t = k+1,….T , where W_t is the recursive residual and *s* is the standard error of the regression fitted to all sample points. If the vector of the parameter remains constant from period to period, E (W_t) = 0, but if this vector changes, W_t will tend to diverge from the zero mean value line. The significance of any departure from the zero line is assessed by reference to a pair of 5% significance lines, the distance between which increases with t.

The 5% significance lines are found by connecting the points

[k, ± -0.948$(T-k)^{1/2}$] and [T, ±3&0.948$(T-K)^{1/2}$]

Movement of outside the critical lines is suggestive of coefficient instability.

CUSUMSQ Test

The CUSUM of squares test (Brown, Durbin, and Evans, 1975) is based on the test statistic

$$W_t = \sum_{r=k+1}^{t} w_r^2 \Big/ \sum_{r=k+1}^{T} w_r^2$$

The expected value of under the hypothesis of parameter constancy is E (S_t) = t-k/T-k which goes from zero at to unity at. The significance of the departure of from its expected value is assessed by reference to a pair of parallel straight lines around the expected value. The CUSUM of squares test provides a plot of against and the pair of 5 percent critical lines. As with the CUSUM test, movement outside the critical lines is suggestive of parameter or variance instability.

vi) Bounds Test (F-version)

The F-test can be used to test the hypothesis about one or more parameters of the k-variable regression model:

$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \ldots\ldots\ldots + \beta_k X_{ki} + u_i$ ……………… (3.9)

Let, the hypothesis to be tested is h_0: $\beta_4 = \beta_5 = \beta_6 = \beta_7 = 0$

Then, another regression by dropping the variables X_{4i}, X_{5i}, X_{6i}, and X_{7i} is run as

$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_8 X_{8i} + \ldots\ldots\ldots\ldots.. + \beta_k X_{ki} + u_i$ ………… (3.10)

And residual sum of squares is calculated from both models. The equation (3.11) is called unrestricted regression equation. The F statistic is calculated by the formula:

$$F = \frac{(RSSR - RSSUR)}{RSS}$$

Where,

RSS_R = RSS of the restricted regression,

RSS_{UR} = RSS of unrestricted regression,

m = number of restrictions,

k = number of parameters in unrestricted regression and

n = number of observations.

According to Pesaran (1997), the bounds test (General F test) can be used test the long run relationship in equation (3.4). However, this uses two sets of values as listed by Pesaran and Shin (1999). One set assumes that all the regressors are I(0) and the other set assumes that all the regressors are I(1).

vii) Augmented Dickey-Fuller (ADF) Test

ADF test statistic is used to examine the stationary of the time series variable. The following regression is run in Augmented Dickey-Fuller (ADF) test to check for unit root of the variables or to check the order of integration:

$$\Delta x_t = \eta + \gamma t + \alpha x_{t-1} + \sum_{j=1}^{k} \delta_j \Delta \chi_{t-j} + \varepsilon_{1t} \qquad \ldots\ldots\ldots\ldots\ldots\ldots (3.11)$$

Where x_t is any variable used in this study, that is NEPSE, Inf, Ygt, M_2, and Usex. Δ indicates the first difference operator and k is the length of lag which ensures residuals to have white noise empirically. The ADF statistic is simply the t-value of the coefficient α in equation (3.11). the null hypothesis is that x_t has a unit root, that is, H_0: $\alpha = 0$ and is rejected if the calculated ADF statistic is above the critical value implying that x_t has no unit root or x_t is stationary.

3.5 The Data

The study is based on the secondary data. The data sources are Quarterly economic Bulletin published by Nepal Rastra Bank (NRB), Economic bulletin published by Ministry of Finance (MOF), Central Bureau of Statistic (CBS) and various articles published by NEPSE.

Chapter 4

ANALYSIS OF DATA

This chapter presents the analysis of data with the estimated results. Section 4.1 presents the ADF test to test the order of integration of the variables. Section 4.2 presents the result from the bound test to test the long run relationship between the variables, the estimated short run model, long run model for NEPSE equation. Section 4.3 presents the result of CUSUM and CUSUMSQ test for the stability of the model.

4.1 Time Series Properties of the Variables

The underlying assumption of ARDL procedure that each variable in the model is either I(0) or I(1). Thus there is no need to check whether the variable is I(0) or I(1). However if any variable is integrated of higher order than one, then the procedure will not be applicable. If any variable is higher than order I(1) then the table value given by Pesaran (1997) do not work. Thus, it is still necessary to perform unit root test to ensure that none of the variables in the equations is I(2) or higher order than I(1). Augmented dickey fuller (ADF) unit root test has been applied to test the order of integration of the variables. Before conducting the ADF test, an attempt is made to identify whether to include trend as a variable in the ADF regression or not. To confirm this, time series graph plot of the variables have been performed in Fig 4.1, Fig 4.2 and Fig4.3.

The time series graph plot in Fig 4.1 and Fig 4.3 shows that Ygt, NEPSE and Inf are not trended variables so only intercepts are included while testing the order of integretion. From the time series graph plots it is obvious that the relevant ADF statistic for checking the order of integretion in case of Ygt, Nepse and Inf is the ADF statistic from the ADF regression including constant but no trend. Similarly, the relevant ADF statistics for checking the order of integretion in case of M_2 is the ADF regression including constant and trend shown in fig 4.2.

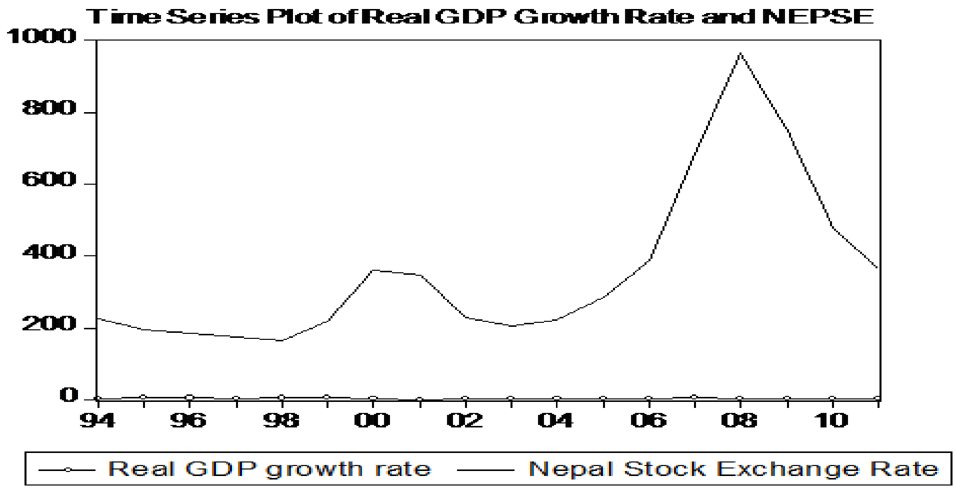

Fig 4.1

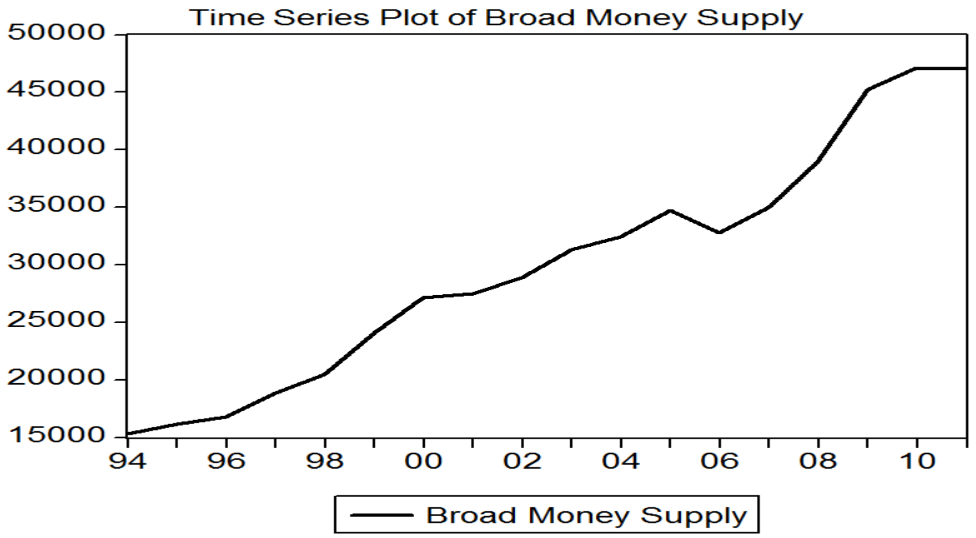

Fig 4.2

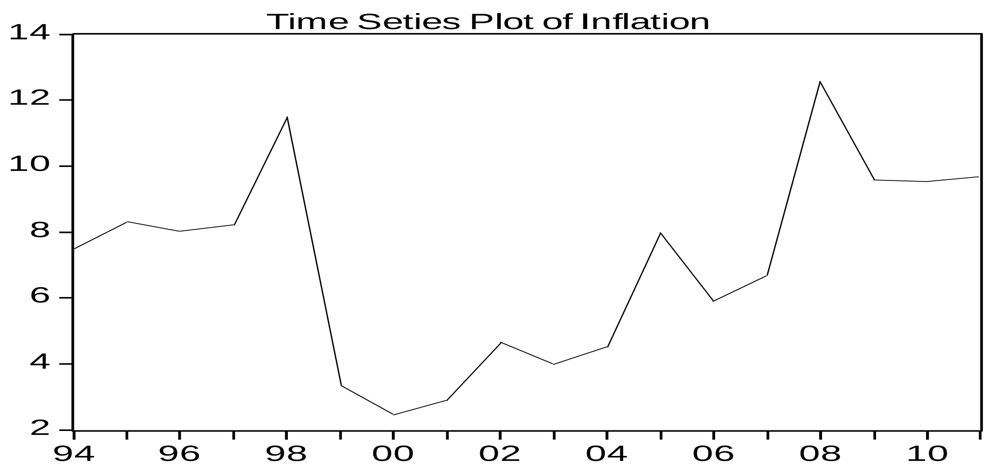

Fig 4.3

Table 4.1 presents the result of ADF test. Since the data is annual, following Pesaran and Shin (1999), only one lag has been used (p=1).

Table 4.1

ADF test results (p=1)

Variables	**Constant but no trend**	**Constant and trend**
Nepse	-2.5736	-4.0790
Δ(nepse)	-3.7884*	-3.6069
Ygt	-3.7453*	-3.5729
Δ(Ygt)	-5.3060*	-6.1552*
Inf	-1.6075	-1.7769
Δ(inf)	-3.7156*	-3.8335*
M_2	-0.2404	-3.2526
Δ(M_2)	-3.2083*	-2.9809

* refer to the rejection of null hypothesis under 5% level of significance.

The critical values are -2.966 (constant but no trend) and -3.6008 (constant and trend) at 5% level of significance.

From the result in table 4.1, it becomes clear that none of the variables are integrated of higher than order one. All the variables are at most integrated of order one. To confirm the order of integration of the variables besides ADF test the autocorrelation function of the variables are examined which lead to the conclusion that the variables Inf, Nepse and M2 are integrated of order one or I(1) whereas the variable Ygt is integrated of order zero or I(0). Since they are of mixed order, the ARDL modeling is the most appropriate approach as suggested by Pesaran and shin (1997).

4.2 Estimation Results and Trend Relationship

Since one of the main objectives of this study is to test the existence of the long run relationship between the variables included in the model, the study follows ARDL approach. Following the Pesaran et al (1996), presence of long run relationship in the NEPSE model is tested using bound test approach. Table 4.2 shows that the results of the calculated F statistic for the one lag order.

Table 4.2

Bound test

Test Statistic	Value	df	Probability
F-statistic	2.907972	(4,4)	0.1629
Chi-square	11.63189	4	0.0203

Note: the relevant critical values with intercept and no trend, number of regressor =4 are 2.425-3.574 at the 90% level of significance and 2.850-4.049 at 95% level of significance.

* denotes the F statistics falls above the 95% upper bound.

The result of the table 4.2 shows that the calculated F-statistic for the model is lower than the upper bound (critical value) at 5% level of significance. Therefore the null hypothesis of cointegretion relationship is accepted implying that there is no long run relationship among the variables. In the second step, equ(3.3) is estimated and different model selection criteria are used to justify the lag order of each variables in the system. Only an appropriate lag selection criterion will be used to identify the true dynamics of the model. The maximum lag order is set 1 following Pesaran and shin (1990) as the data are annual and there are only 17 observations.

With this lag order the adjusted sample period for analysis becomes 1996-2011. This setting also helps to save the degree of freedom as sample period for the analysis is quite small. Following the lag order criteria based on different criteria on Eviews, the maximum number of lag (p) is selected. The ARDL (1, 1, 1, 1) model is selected on the basis of all criteria like adjusted R^2, Schwarz Bayesian criteria (SBC), Akaike information criteria (AIC) and Haan Quinn criteria. According to Pesaran (1997) AIC and SBC perform relatively well in Small samples, although the SBC is slightly superior to AIC (Peseran and Shin 1999). Besides SBC is parsimonious as it uses minimum acceptable lag while selecting the lag length and avoid unnecessary loss of degree of freedom. Therefore SBC criteria have been used, as criteria for the optimal lag selection in all cointegretion estimations.

After selecting the appropriate lag order of each variable in the system, equ (3.3) is re-estimated. The results of the estimation along with diagnostic statistics are presented in table 4.3.

Table 4.3

Full information of the ARDL estimate results

Dependent Variable**:** ΔNEP (NEPSE)

Method: Least Squares
Sample(adjusted): 1996 -2011
Included observations: 16 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-109.9416	151.8645	-0.723945	0.5092
YGT(-1)	-47.94022	74.11467	-0.646838	0.553
INF(-1)	36.3311	25.96101	1.399449	0.2343
M2(-1)	0.012766*	0.004325	2.951713	0.0419
NEP(-1)	-0.74058*	0.278685	-2.657431	0.0465
Δ(YGT)	-13.78045	38.58313	-0.357163	0.739
Δ(INF)	8.666245	8.699573	0.996169	0.3755
Δ((M2)	-0.001663	0.017336	-0.095934	0.9282
Δ(YGT(-1))	43.03841	25.25575	1.704103	0.1636
Δ(INF(-1))	-33.74459	11.98631	-2.81526	0.0481
Δ(M2(-1))	-0.034913	0.017943	-1.945736	0.1236
Δ(NEP(-1))	1.219361	0.253198	4.815839	0.0085

R-squared	0.952404	Mean dependent	10.4625
Adjusted R-squared	0.821513	S.D. dependent var	152.9853
S.E. of regression	64.63278	Akaike info criterion	11.28903
Sum squared resid	16709.59	Schwarz criterion	11.86847
Log likelihood	-78.31221	F-statistic	7.276349
Durbin-Watson	3.355161	Prob(F-statistic)	0.035062

Diagnostic tests

Tests	F-statistic	Probability
Serial Correlation(LM)	2.842368	0.260256
Normality(JB)	0.608306	0.737748
RESET	1.70739	0.2824

Table 4.3 indicated that the overall goodness of fit of the estimated ARDL regression model is good with the result of adjusted R^2=0.821513. From the diagnostic tests, it is clear that the model passes all the tests. Also from the table 4.2 null hypothesis of normality of the residuals and the null hypothesis of no first order serial correlation are accepted at 5% level of significance and null hypothesis of misspecification of functional form can be accepted at 5% level of significance. Since the LM version of misspecification test is a large sample test, it is more appropriate to conclude on the basis of F version of RESET test. The diagnostic test indicates that at 5% level of significance, the model has no problem with serial correlation and normality of the residuals. But it shows a little bit problems in functional form.

The long run model of the corresponding ARDL (1, 1, 1, 1) for the Nepse equation can be written as follows:

$Nepse = -148.452 + 49.057 Inf + 0.01723 M_2 - 64.732 Ygt$

The long run coefficient are the values of $\partial_{i,}$ i=2, 3, 4&5 of equation (3.4) normalized on Nepse dividing the coefficients by coefficient ($-\partial_1$). The long run coefficients are presented in table 4.3.

The above model shows that M_2 is statistically significant whereas coefficients of, Inf and Ygt are statistically insignificant. The coefficient of M_2 is positive i.e 0.01723. It shows that Money supply affects positively in the long run. Quantitatively, a unit increase in inflation will cause to increase Nepse by 0.01723 units. This findings is consistent with the findings of Najand and Rahman (1991), Homa and Jaffe (1971) and Homburger and Kachin (1972).

The long run coefficients using ARDL approach are estimated and presented in table 4.4 in the following section.

Table 4.4:

Estimated long run coefficients using ARDL approach

ARDL (1, 1, 1, 1) selected based on Schwarz Bayesian criteria.

Dependent variable is NEPSE(NEP):

Sample (adjusted): 1996-2011

Included observations: 16 after adjusting endpoints.

Variable	coefficients	t-statistic(prob)
Ygt	64.732	0.646838(0.553)
Inf	49.057	1.399(0.2343)
M_2	0.01723*	2.951713(0.0419)

*shows significance of coefficient at 5% level of significance.

Similarly, the coefficient of Inflation is 49.057 which statistically insignificant reflected by the t-ratio and states that there is no relationship between inflation and stock price in long run. This finding is consistent with the finding of Gjerda and Saettem (1999) and Chen ,Roll and Ross (1986).

The coefficient of Ygt is 64.732, which is also statistically insignificant reflected by t-statistics in table (4.4). It states that there is no long run relationship between economic growth rate and stock price in Nepal.

The long run coefficients are used to generate error correction. Above cointegretion analysis between the macroeconomic variables and stock price states that there is no cointegretion relationship between the variables in the model. Hence, ARDL model argues that we need not to go through ECM (Pesaran and Shin, 1997).

The whole finding of the model is consistent with the work of Imran et al (2010). There might be many reasons behind it in Nepal. Firstly, it may be due to market imperfection. Nepalese financial market is too small and it is in the hands of limited brokers and they can manipulate stock price easily. Secondly, Structural variables in

Nepal are static in nature which does not allow macroeconomic variables to influence stock price and non economic factors may be playing significant role in determining stock price. The sample size of this study is too small. It may not be sufficient to generate the cointegretion relationship. Finally, one of the important reasons may be that NEPSE publishes data four times a week. Its impact goes on decreasing as we take its average weekly, monthly, semi-annually and annually. This may be the reason of no cointegretion as the data are taken annually.

4.3 Stability Tests

Finally the stability of long run coefficients is examined. In doing so, Pesaran and Pesaran (1997) have been followed and the CUSUM and CUSUMSQ tests purposed by Brown, Durbin and Evans (1975) have been applied.

The tests are applied to the residuals of the two models following Pesaran and Pesaran (1997), Specifically the CUSUM test makes use of cumulative sum of recursive residuals based on the first set of n observations and is updated recursively and plotted against break points. If the plots of CUSUM statistic stays within the critical bounds of 5% significance level represented by the pairs of straight lines drawn at 5% level of significance whose equations are given in Brown, Durbin and Evans (1975), the null hypothesis that all the coefficients in the error correcting model are stable cannot be rejected at the 5% level of significance. A similar procedure is used to carry the CUSUMSQ test which is based on the square of recursive residuals. Fig 4.4 and Fig 4.5 Shows the graphical representation of the CUSUM and CUSUMSQ plot applied to the model selected by the SBC criteria which are presented in Appendix C. Since the graph of CUSUM and CUSUMSQ statistics stays comfortably well within the 5% level of significance. It is concluded that estimated NEPSE model is stable.

Chapter 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The study is primarily meant to investigate the long run relationship between NEPSE and macroeconomic variables using annual data over the period of 1994 to 2011. It has followed the ARDL approach to cointegreting and Error correction model developed by Pesaran and Shin (1999) and Pesaran et al (1996)) to examine the trend relationship. It includes the findings from the study and draws some conclusions in section 5.1 , 5.2 has some recommendations that has been made from the conclusion of the study and 5.3 presents the areas of further studies.

5.1 Summary of the findings and Conclusions

The main purpose of the study is to examine the long run relationship between NEPSE and macroeconomic variables viz. Ygt, M_2 and Inf included in the model. All these variables satisfy the condition of stationary as reflected by ADF test presented in table 4.1. There are a few works found on the relationship between stock price and macroeconomic variables in national literature. However, the empirical studies at the national level gave a clear indication. The macroeconomic variables that that can have significant influence on NEPSE index, guided by that indication the variables were selected. Also, it is concluded from the empirical literature that the variables in the model were found relevant.

This research work is an attempt to find the relationship between NEPSE Index and selected macroeconomic variables using ARDL model over the period of 1994 to 2011. The major findings and conclusions of the study are:

a) There exists no cointegreting relationship between NEPSE and Macroeconomic variables included in the model.
b) The significant determinant of NEPSE in case of Nepal according to this model is Broad money supply.
c) The other variables Inflation and Economic growth are statistically insignificant.
d) The only significant macroeconomic determinant according to the model is broad money supply and is positively associated with NEPSE. and

e) ECM is not performed as the cointegretion relationship between the variables do not exists as stated by ARDL model.

5.2 Recommendations

Given that the study has established the existence of a link between macroeconomic fundamentals and stock market returns and volatility, there are several implications that follow. One such implication is that policy makers can influence stock market activity through macroeconomic policy being pursued as such they always have to be aware of the consequences of their policies on the stock market. For instance unstable macroeconomic policy may result into high volatility of returns on the market. Another implication from the study is that investors can study the macroeconomic environment in order to determine appropriate times to either enter or exit the stock market. From the conclusions of the study, the following recommendations can be made:

It is concluded from the result of this study that NEPSE is affected by broad money supply and is positively affected by it. So it is better for the investors to invest in shares by observing change on it. Besides, the central bank can influence stock price significantly as reflected by the model. But the other variables economic growth rate and inflation are statistically insignificant. So, it can be recommended that investors can invest their fund in shares ignoring economic growth and inflation in long run.

5.3 Areas for Further Study

Further studies on the Nepal stock exchange may wish to study the performance of individual stocks on the market and how each of these are influenced by these macroeconomic fundamentals. Since in this study only NEPSE is studied, which is an overall index, future studies may also try using the Domestic Share Index and the Foreign Share Index separately. Apart from macroeconomic issues, there are also other factors that are known to influence to stock returns and volatility, and these include factors like: company performance, market rumors, political instability, as well as international economic conditions, and it is these factors that may have to be considered by policy makers when making policy and by investors when making investment decisions. Future studies may also wish to empirically explore how the above mentioned factors impact returns and volatility.

Other areas that can be explored in order to gain more understanding are explained below. For instance, the present study would have preferred to use monthly stock returns for our data, but this was unavailable, so we settled for annual data. So future studies may use monthly and daily data as well and see if this changes the results in any way. Future studies, may also use different explanatory variables such as Industrial production, crude oil prices, international stock indexes just to examine how these interact with domestic return.