DEPARTMENT OF
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MATHEMATICS

DETERMINANTS OF BALANCE OF TRADE IN GHANA

A PROJECT REPORT

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DECLARATION

DATE: ……/……/……

This study was undertaken independently and it is my original work. It is not replication of any work either published or unpublished. All references made in this study are duly acknowledged. Finally, all aspects of study have been discussed with and approved by my supervisor.

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This project report was written under my supervision and the Student has been consistent in her interaction with me for guidance and direction. She has my consent to present it for assessment.

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Signature
DEDICATION

This project work is lovingly dedicated to my family and friends who have been my constant source of inspiration and support both spiritually and financially.
ACKNOWLEDGEMENT

My in-depth gratitude goes to the God Almighty for His care, love and protection and making this project see the light of the day. My sincere appreciation also goes to my supervisor, Mr. Gabriel O. Fosu for an unprecedented supervision, outstanding master-minding and most of all encouragement given me throughout my project report writing. Moreover, Tons of gratitude goes to Rev. Dr. G.O. Larrey (Head of Mathematics Department) and all the lecturers of mathematics department for what I am today by their conscious effort to giving me the best of life’s attainment in education.

Again, my profound gratitude goes to all my friends, colleague students (Daniel Ntiamoah, Yaw Atta, SaviourGyawu, Mustapha Huno, Ebenezer A. Ofosu, Eshun Kofi Paul) through whom this project report is made real.

Finally to my parents, and Directors (Human Resource, Research, Statistics and Information Management Directorate of Ministry of Trade and Industry) and any other wonderful person whose name is not mentioned in the above for his/her immense contribution towards this project report writing. I say God richly bless you all.
ABSTRACT
The study focused on the analysis of the main determinants that have an impact on trade balance. Specifically, this study focused on the main cause of Trade deficit in Ghana by analyzing the impact of Foreign Direct Investment (FDI), Household Consumption Expenditure (HCE), Government Expenditure (GE), Inflation (I), Real Exchange Rate (REX) and Net Income (NY). In this study Regression analysis was used with a sample data period spanning from 2005-2013 by the help of R console. The literature reviews of the previous researchers have the mixed results on the factors in questions. However this study tried to use more variables that have rarely been explored specifically in Ghana and found out that the main influencing factors for the case of Ghana are Real Exchange Rate (REX), Household Consumption Expenditure (HCE), Government Expenditure (GE), Inflation (I), Net Income (NY) and so suggested policy measures should focus on them to reduce the trade deficit in the Ghanaian economy.
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CHAPTER ONE
INTRODUCTION

This chapter consists of background of the study, statement of the problem, objectives of the study, specific objectives of the study, significance of the study and organisation of the study thereof.

1.1 Background of the Study

The balance of trade is essentially another term for net exports. Net exports are the difference between exports to the foreign sector and imports from the foreign sector. Imports are goods and services produced by the foreign sector and purchased by members of the domestic economy. Exports are goods and services produced by the domestic economy and purchased by the foreign sector.

A balance of trade deficit then exists if imports exceed exports or net exports are negative. In contrast, a balance of trade surplus exists if exports exceed imports or net exports are positive. The balance of trade can also be "in balance" if exports equal imports and net export is zero.

1.1.1 Why? How?

A balance of trade deficit arises if imports exceed exports. Why does this happen? How might this occur?

The simple answer is that a country is exporting fewer goods and services to the foreign sector than it is importing from the foreign sector. A more complex answer requires a closer look at both exports and imports.

- Exports: A decrease in exports is just the thing that can create a balance of trade deficit. This might occur for reasons beyond control of the domestic economy, perhaps due to declining prosperity and stagnant economic activity in the foreign sector. Or an increase in exports might result from policy actions taken by the domestic economy specifically designed to decrease exports, including manipulation of currency exchange rates which can raise the effective price of exports.

- Imports: A balance of trade deficit can also result from an increase in imports. This might occur when domestic expenditures (especially consumption) are induced to increase by an expanding domestic economy. Or an increase in
imports might result from policy actions specifically designed to boost imports, including a reduction in quotas or tariffs on imports or manipulation of currency exchange rates.

1.1.2 What It Means?
Why exactly is a balance of trade deficit considered "unfavorable" or harmful to the domestic economy? A deficit in the balance of trade arises if the value of imports exceeds the value of exports. In terms of "payments," this indicates that the domestic economy is generating a net because imports exceed exports with a balance of trade deficit, domestic producers, on net, suffer whereas domestic consumers, on net, benefit. The end result is that a balance of trade deficit is "unfavorable" to domestic producers but often "favorable" to domestic consumers.

The "unfavorable" descriptor is commonly attached to a balance of trade deficit, in part, due to the aggregate impact on the domestic economy, but also in part because domestic producers tend to have more clout and their preferences tend to be more widely recognized than domestic consumers. (Johnson, Chalmers. 1998. “Asia’s Financial Meltdown). Effects in favor of the trade balance improvement, assuming that the Marshall-Lerner condition holds. (Appleyard and Field, 1992)

1.1.3 Ghana Import, Export and Trade Balance with the Rest of the World
In 2011 Ghana recorded a trade balance deficit amounted US$3,183 million compared to that recorded in 2010 which amounted to USD 2,647.9 million. The expansion of the deficit was mainly caused by the increase in the value of goods imports, compared to the value of exports. (World development indicators (2012)). Domestic income, foreign income, and money supply but this study tries to cover that gap by exploring other variables that only few literature reviews were available and the fact that they might have an impact for the Ghanaian economy.

1.2 Statement of Problem
Initially, a trade deficit is not a bad thing. It raises the standard of living of a country's residents, since they now have access to a wider variety of goods and services for a more competitive price. It can reduce the threat of inflation, since the products are priced lower. A trade deficit can also indicate that the country's residents are feeling confident, and wealthy, enough to buy more than the country produces. Obviously, a
trade deficit is caused when a country cannot produce all it needs. However, the true causes run a little deeper than that. A country cannot have a trade deficit unless other countries are willing to loan it the funds needed to finance the purchases of imports. Therefore, a country with a trade deficit will most likely have a current account deficit.

Friedman and other economists point out that a large trade deficit (importation of goods) signals that the currency of this country is strong and desirable. Citizens of such a country also receive the benefit of having the ability to choose between many competing consumables and lower prices than they would otherwise experience, if the currency was weaker and the country was enjoying a trade surplus. To Milton Friedman, trade deficit simply means that consumers get to purchase and enjoy more goods at lower prices, conversely, a trade surplus implies that a country exported goods that its own citizens did not get to consume and while paying high price for the goods that were consumed. (Ethier, 1983)

A positive balance of trade is a trade surplus and consists of exporting (in financial capital terms) than one imports. Negative balance of trade also known as a trade deficit or informally, as a trade gap consists of importing more than one export. Neither is necessarily dangerous in modern economies, although large trade surpluses or trade deficits may sometimes be a sign of other economic problems.

The balance of payments account is divided into current account, capital account and official financing balances. The current account balance is subdivided into two; the trade balance, which is the balance between visible exports and imports, and the balance of services or the balance of invisibles. A deficit in the balance of trade may likely affect the position of the current account leading to unfavourable balance of payments.

Many countries, especially developing ones face persistent balance of payments problems for many reasons; high debt servicing, deteriorating terms of trade, expansionary monetary policies, price distortions or a combination of these factors. In attempt to solve this problem, some nations seek balance of payment support from external sources including the International Monetary Fund (IMF), debt relief from creditors, and planned adjustment process. Exchange rate adjustment is essentially part of this adjustment process.
The Trade balance of most of the Sub-Saharan African countries over many years has not been so encouraging. In fact a lot of these countries have been experiencing trade deficits in their economy. One of the main reasons for such performance is the poor economic strategies that have been adopted by these countries in their economic reforms and also most of these countries usually depends on certain specific primary products for their exports and import a lot of the manufactured goods hence huge trade deficit in their economy. Ghana is not an exception of this group of countries that have implemented several economic policies with the purpose of improving trade balance and promote its economic development. Ghana has, since independence, been confronted with the problem of adopting the appropriate exchange rate policy that will be suitable for economic growth and stability. In order to achieve this objective, the country has carried out several major reforms in the exchange rate system, supported by macro-economic policies and liberalisation of the exchange rate and trade systems.

In addition to the above, it has adopted a number of corrective measures on her exchange rates dominated by devaluing her currency since 1967. The aim is to encourage exports and discourage imports for the purpose of improving her current account balance. However, the foreign exchange rate adjustments have not proved supportive to the country’s external trade since our balance on the current account is dominated by deficits. This means that, the country has not achieved the desired objectives. Ghana’s Imports have greatly exceeded exports, resulting in large trade deficits in the economy. Some major policies like trade Liberalization was introduced and effectively implemented with the purpose to improve the trade balance without any significant improvement. Due to this prolonged trade imbalance then it makes sense to continue examining some factors that could be the main cause of this trade deficit and identify them.

1.3 Objective of the Study
The main objective of this study is to re-examine by estimating and identifying the main factors that affect Ghana’s trade balance.

1.3.1 Specific Objectives of the Study
- To find out the main cause of the trade deficit in Ghana.
- To compare the factors that causes trade deficit with that of a surplus country.
1.4 Significance of the Study
The significance of this research is to provide a better knowledge and understanding of the factors that affect trade balance and also identify in which point Ghana is not doing better so that more effort and new measures can be taken to increase economic growth which will come by exporting more and importing less and hence reduce the range trade deficit of this country and if possible attain trade surplus. Also new policy measures can be raised up to reduce the range of trade deficit which lies in Ghana trade balance.

1.5 Organisation of the Study
This thesis consist of five chapters, chapter one deals with the background of the study, statement of the problem, objectives of the study, specific objectives of the study, significance of the study and organisation of the study. Chapter two reviews literature related to the study area. Chapter three presents the methods used in gathering the data and the fourth chapter presents the analysis and discussion of the findings of the study. The conclusion thereof, and recommendations meant to address findings is the subject matter of chapter five.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction
This chapter presents a review of theoretical and empirical literature on the international trade. The chapter is organized in three main sections. The first section is devoted to the review of theoretical literature on international trade. Presented in this section include classical and contemporary theories on the causes of trade, the theoretical justifications. Empirical literature on recent applications on related research.

2.2 Definition of Terms
Trade is a basic economic concept that involves multiple parties participating in the voluntary negotiation and then the exchange of one's goods and services for desired goods and services that someone else possesses. The advent of money as a medium of exchange has allowed trade to be conducted in a manner that is much simpler and effective compared to earlier forms of trade, such as bartering. In financial markets, trading also can mean performing a transaction that involves the selling and purchasing of a security. (http://www.investopedia.com/terms/t/trade.asp)

International trade is the exchange of capital, goods, and services across international borders or territories. In most countries, such trade represents a significant share of gross domestic product (GDP). While international trade has been present throughout much of history, its economic, social, and political importance has been on the rise in recent centuries. It is the presupposition of international trade that a sufficient level of geopolitical peace and stability are prevailing in order to allow for the peaceful exchange of trade and commerce to take place between nations. (http://en.wikipedia.org/wiki/International_trade)

Trading globally gives consumers and countries the opportunity to be exposed to goods and services not available in their own countries. Almost every kind of product can be found on the international market: food, clothes, spare parts, oil, jewelry, wine, stocks, currencies and water. Services are also traded: tourism, banking, consulting and transportation. A product that is sold to the global market is an export, and a product that is bought from the global market is an import. Imports and exports are accounted for in a country's current account in the balance of payment.
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Industrialization, advanced technology transportation, globalization, multinational corporations, and outsourcing are all having a major impact on the international trade system. Increasing international trade is crucial to the continuance of globalization. Without international trade, nations would be limited to the goods and services produced within their own borders. International trade is, in principle, not different from domestic trade as the motivation and the behavior of parties involved in a trade do not change fundamentally regardless of whether trade is across a border or not. The main difference is that international trade is typically more costly than domestic trade. The reason is that a border typically imposes additional costs such as tariffs, time costs due to border delays and costs associated with country differences such as language, the legal system or culture.

Another difference between domestic and international trade is that factors of production such as capital and labor are typically more mobile within a country than across countries. Thus international trade is mostly restricted to trade in goods and services, and only to a lesser extent to trade in capital, labor or other factors of production. Trade in goods and services can serve as a substitute for trade in factors of production. Instead of importing a factor of production, a country can import goods that make intensive use of that factor of production and thus embody it. An example is the import of labor-intensive goods by the United States from China. Instead of importing Chinese labor, the United States imports goods that were produced with Chinese labor. One report in 2010 suggested that international trade was increased when a country hosted a network of immigrants, but the trade effect was weakened when the immigrants became assimilated into their new country.
International trade is also a branch of economics, which, together with international finance, forms the larger branch called international economics. Trading is a value-added function: it is the economic process by which a product finds its market, in which specific risks are to be borne by the trader.
(http://en.wikipedia.org/wiki/International_trade)

2.3 Review of Traditional Theories on Why Countries Trade

Modern trade theory is the product of an evolution of ideas in economic thought. In particular, the writings of the mercantilists, and later, those of the classical economists – Adam Smith, David Ricardo, and John Stuart Mill – have been instrumental in providing the framework of modern trade theory. The major pre-occupation of these international trade theorists was to explain the pattern of trade (i.e. which country trades in what good with which country). In addition to predicting and explaining the composition and direction of international flows of goods and services, the array of trade theories that have been developed over the years also sought to assess the impact of trade flows on domestic welfare and to predict how national policies affect these flows, the prices of traded commodities, the prices of productive factors and, through them, domestic welfare of consumers. Since these early views on trade form the foundation of contemporary trade theory, and some of these views still influence present-day trade policy from time to time, in this section, we present a concise overview of these classical theories in terms of their views on the causes of international trade.

The ideas of Adam Smith, David Ricardo, and other classical economists emerged in reaction to the mercantilists’ view on trade and on the role of the government. Adam Smith demonstrated that the potential to gain from specialization applies not only to the assignment of tasks within a firm but also to trade between countries. Smith reasoned that trade between countries is based on absolute advantage, which exists when countries differ in their ability to produce commodities arising from differences in technology. According to Smith, a country should export products in which it is more productive than other countries (that is, goods for which it can produce more output per unit of input than others can and in which it has an absolute advantage) and import those goods where it is less productive than other countries and has an absolute disadvantage. With free trade and government pursuing laissez-faire policies, Smith
argued that world output will rise; because of more efficient utilization of productive resources resulting from specialization and division labour. Both nations will, then, end up consuming more of both commodities after exchanging (through trade) part of its output with the other nation for the commodity of its absolute disadvantage (Carbaugh, 2006; Dunn & Mutti, 2005; Salvatore, 1998).

The theory of absolute advantage seems to make sense in situations where the geographic, climatic conditions, special skills and techniques and the economic environment give natural or acquired absolute advantage to some countries in the production of certain goods and services over the others. However, Adam Smith’s absolute advantage can explain only a very small part of the world trade today because, it is unable to explain why nations which are more efficient in the production of all the traded goods still trade with partners which have absolute disadvantage in the production of all the traded goods (Carbaugh, 2006; Salvatore, 1998).

Dissatisfied with this looseness in the absolute advantage theory, David Ricardo (1772–1823) extended the insight from Smith’s free trade theory into the concept of comparative advantage to demonstrate that there exists basis for mutually beneficial trade, even when one country is absolutely more efficient in the production of all goods than the other, provided that their relative costs, that is, the ratios of their real costs in terms of labor inputs, are different for two or more commodities. Ricardo posited that, a country that is less productive in two goods still can gain from trade by exporting the good in which its relative disadvantage is smaller, because its relative price of this good before trade will be lower than abroad. A country that has an absolute advantage in both goods gains by specializing in the production of the good in which its relative advantage is greater. It can gain from trade by importing the product in which its relative advantage is smaller, because the foreign opportunity cost of producing it is lower. Thus, Ricardian model demonstrates that it is the difference in technology between the nations that give comparative advantage to some countries in the production of certain goods over others and motivates advantageous international trade (Anderson, 2004; Dunn & Mutti, 2005; Suranovic, 2006). Although empirical verifications (MacDougall, 1951; Balassa, 1963 and Stern, 1962) confirm Ricardo’s postulation that comparative advantage is based on a difference in labor productivity, the Ricardian trade model was criticized for its unrealistic underlying assumptions and
its inability to neither explain the reason for the difference in labor productivity across nations nor the effect of international trade on factor earnings (Salvatore, 1998).

To explain the source of international differences in productivity – the factor that determines comparative advantage and the pattern of international trade –, two Swedish economists, Eli Heckscher (1919) and Berlin Ohlin (1933) extended the Ricardian trade model into what has become known as the Heckscher–Ohlin (H-O) theory by introducing one more input, namely, capital, in addition to labour in the Smithian and Ricardian models. Heckscher and Ohlin argued that comparative advantage arises from differences in national resource or factor endowments. The more abundant a factor is, the lower is its cost, giving the country the proclivity to adopt a production process that uses intensively the relatively abundant factor. By assuming that different commodities require that factor inputs be used with varying intensities in their production, the H-O model postulates that countries will export goods that make intensive use of those factors that are locally abundant, and import goods that make intensive use of factors that are locally scarce. In other words, capital-abundant countries like the U.S.A, and other industrial economies should export capital-intensive products, and import labor-intensive products from labor-abundant countries like Ghana and other developing economies (Hill, 2009; Salvatore, 1998).

In view of Wassily Leontief (1953)’s paradoxical finding regarding the pattern of trade in United States, and the inconclusive findings from many other empirical studies which tested the predictions of the H-O model in other countries, alternative theories of comparative advantage have been developed to explain the great deal of contemporary trade (between similar countries) that is left unexplained by the H-O theory. The sources of comparative advantage in these new trade theories are based on tastes and preferences, economies of scale, imperfect competition, and differences in technological changes among nations.

In contrast to the usual supply side theories (which tend to explain why production costs are lower in one country that in another), Stefan Linder (1961) presenting his similarity of preferences (or overlapping demands) theory, argued that an explanation for the direction of trade in differentiated manufactured products lies on the demand side rather the supply side. Linder hypothesized that countries with similar standards of living (proxied by per capita GDP) will tend to consume similar types of goods. Since the
standards of living are determined in part by factor endowments, Linder argued that capital abundant countries tend to be richer than labour abundant countries. Thus, there should be a considerable volume of trade between countries with similar characteristics. Implicatively, rich (developed or industrial) countries should trade more with other rich countries, and poor (or developing) countries should trade with other poor countries. Whilst this implication of Linder’s hypothesis sharply contravenes the predictions of the H-O theory (in which countries with dissimilar factor endowments would have the greatest incentives to trade with each other, due to disparity in pre-trade relative prices), it provides explanation for the extensive trade observed among the rich countries, which makes up a significant share of world trade. In addition to this, it provides explanation for the existence of intra-industry trade, an important feature of international trade which involves the simultaneous import and export of similar types of products by a country. Studies like Jerry and Marrie Thursby (1987) and Bergstrand (1990) have reported evidence in favour of Linder’s theory.

Raymond Vernon (1966) proposed the hypothesis that new products pass through a series of stages in the course of their development, and the comparative advantage of the producers in the innovating country will change as products move through this product cycle. The theory, often referred to as the “Vernon product cycle,” applies best to trade in manufactured, as opposed to primary, products (Dunn & Mutti, 2005).

Paul Krugman also developed a new trade theory in 1983 in response to the failure of the classical models to explain why regions with similar productivity trade extensively. Krugman’s new trade theory suggests that the existence of economies of scale (or increasing returns to scale) in production is sufficient to generate advantageous trade between two countries, even if they have similar factor endowments with negligible comparative advantage differences (Soranovic, 2006; Carbaugh, 2006). As explained by Carbaugh (2006), the increasing-returns trade theory, asserts that a nation can develop an industry that has economies of scale, produce that good in enormous quantity at low average cost, and then trade those low-cost goods with other nations. By doing the same for other increasing-returns goods, all trading partners can take advantage of economies of scale through specialization and exchange.

Finally, the existence of government policies, such as government tax, Research and Development (R&D) subsidies, antitrust immunity, loan guarantees, low-interest-loans and trade protection policies can be sufficient to generate comparative advantages in
production of certain products. Proponents maintain that government should actively enact policies that encourage resources to move towards the development of emerging, “sunrise” (i.e. hi-tech), industries identified with strong linkages with the rest of the economy, strong future competitiveness, and highest growth prospects. Over the course of time, these policies would create a dynamic comparative advantage for the domestic economy, allowing it to enjoy a higher average level of productivity and be more competitive in the world markets.

Today, every industrialized country and many less-developed countries use industrial policies to develop or revitalize basic industries, including, steel, chemicals, autos, transportation and other essential manufactures. Advocates of industrial policy typically cite Japan as a nation that has been highly successful in penetrating foreign markets and achieving rapid economic growth (Carbaugh, 2006).

2.3.1 Review of Related Research
Studies on the issues relating to the determinants of trade balance have been conducted by previous researchers with mixed results for example the following Seventeen (17) researchers examined the determinant of trade balance in Tanzania by focusing on trade in goods from the year 1970’s until 2002 using the variables like Real Exchange Rate, Foreign Income, Foreign Direct Investment, Household Consumption, Government Expenditure and Trade liberation.

The first researcher in his studies used the ordinary least square (OLS) method for the estimations of the variables and found out that only three variables namely Government expenditure, Household Consumption And Trade Liberalization were the main determinant of balance of trade in Tanzania. (SayuniMbayani (2006)). His study will differ with this study by employing additional variables like the inflation and the period covered for the study.

The forth investigated the determinants of trade balance by using OLS for the period 1970 to 2010. In his studies he used variables like Real Exchange Rate, Governments Consumption Expenditure, Foreign Income, Domestic Income, Foreign Direct Investment and Money Supply and discovered that Real Exchange Rate, Governments Consumption Expenditure, Domestic Income and Money Supply were the main
significant factor in Kenya while the results found foreign income not to be significant factor (Edward Nienga (2010)).

The fifth in his study of the effects of budget deficit on trade balance in Nigeria found some evidence from policy simulations and shows that budget deficit arising from increased Government spending adversely affects the trade balances irrespective of whether it is money-financed or by external borrowing. (Dickey, D.A. and W.A. Fuller (1979)).

The seventh investigated real exchange rate and trade balance relationship in Malaysia for a period 1955 to 2006, their empirical study showed that there is an existence of long run relationship between Trade Balance and Exchange Rate, other major variables that were significant includes the Domestic Income and Foreign Income. Their results also indicated the no j-curve effect in Malaysia. (HarWai-Mum, Ng Yuen-ling and Tan Geoi-Mei (2008)).

The eighth investigated the determinants of trade balance and adjustment to the crisis in Indonesia. His results suggested that trade balance will improve due to the devaluation through an increase in exports and a collapse in imports. Since the elasticity of import with respect to real exchange rate was higher than that of export then according to him that phenomenon implied that trade balance improvement would come from the import compression. (Imam Sugema (2005)).

The ninth analyzed the determinants of the Turkish trade balance using the ARDL bounds testing, his estimation results indicated that Real Exchange Rate depreciations improves the trade balance with a strong and significant value while Domestic Real Income affects the trade balance negatively and that trade balance is strongly improved due to an increase in foreign real income. No significant effect of crude oil prices can be observed on trade balance. (Korap, Levant (2011)).

The eleventh analyzed a dynamic panel data analysis on the determinants of trade balance of Bangladesh for about 26 years with variables like real GDP, relative GNI, real exchange rate and import weighted index and discovered that import weighted index is significant in both short run and long run while other remaining variables were significant only in short run. (M. ZakirSaadullar K. and M. Ismail H. (2012)).

The twelfth researcher was the first to notice that the U.S. trade balance deteriorated despite devaluation of the dollar in 1971. He then theoretically argued that it is possible
for the trade balance to deteriorate subsequent to currency depreciation, mostly due to lags in the response of trade flows to a change in exchange rate but once the lags are realized then eventually the trade balance improves. (Magee S. P. (1973)).

The thirteenth researcher did his studies on the trade balance effects of U.S. foreign direct investment (FDI) in Mexico. His analysis showed that the rise of intra firm exports and imports following U.S. FDI in Mexico suggests that FDI affects trade flows. (Peter W. & Sarah T. (2006)).

The fifteenth contrary to other authors argues that "response of the trade balance to the Real Exchange Rate varies by country with the nature of the trade." They then investigated the short-run and long-run response of the bilateral trade balance to a change in real bilateral exchange rate between the United States and each of its major trading partners (Canada, France, Germany, Italy, and Japan) and concluded that there is no statistically significant relationship between Trade Balance and Real Exchange Rate, either in the short run or in the long run. (Rose & Yellen (1989)).

The seventeenth examined the determinants of Pakistan’s trade balance using ARDL Co integration approach for a period 1970 to 2005 and found the existence of a stable relationship between trade balance and income, money supply and exchange rates. The exchange rate results confirmed the marshail learner condition with a depreciation which was positively related to trade balance. (Waliullah, Mehmood K.K, Rehmatullah K. and Wekeel K. (2010)).
CHAPTER THREE
REVIEW OF METHODS

This chapter presents the theoretical framework of the model, methods or procedures and the design used in the collection of the data and the review of theory of statistical methods.

3.1. Theoretical Framework of the Model

The hypothesis can be written as:

$H_0: \pi = 0$

$H_1: \pi \neq 0$

3.2. Brief Explanation of Variable

3.2.1 Real Exchange Rate (REX)

REX the rise of domestic price (Devaluation/depreciation) means import (IM) will become more expensive than Export (EX) so with devaluation we expect to have a positive sign [e.g. 1]: noted that in an effort to gain international competitiveness and help to improve its trade balance, a country may let its currency to devaluate or allow her currency to depreciate. On the contrary the decrease of real exchange rate (evaluation/appreciation) may lead to the deterioration of balance of trade in this case the negative sign is expected.

3.2.2 Household Consumption Expenditure (HCE)

The rise of Household consumption expenditure especially on import which might be due to the rise of income tends to worsen trade balance. Hence we expect that to have a negative sign.

3.2.3 Net Income (NY)

As the Net income increase then more is expected to be imported from Ghana hence this will improve the trade balance of the country. Therefore it is expected to have a positive sign.
3.2.4 Government Expenditure (GE)
The rise of this will worsen trade balance and so it is expected to have a negative sign. Since increase in expenditure in non-productive sectors always tends to have a negative effect on the trade balance of the country.

3.2.5 Foreign Direct Investment (FDI)
Foreign direct investment assist in improving trade balance especially if the multinational company motives is for export in this case we expect the positive sign however as noted by other researchers that it is possible FDI to have a negative impact on trade balance as it may be accompanied by the higher importation of the intermediate goods and the fact that FDI take sometimes to be realized however in this study we hypothesize a positive sign.

3.2.6 Inflation (I)
When inflation is low, it implies that the economy is in the “loose money cycle" and when inflation is high, it means that the economy is in "tight money cycle". In theory, when the economy is in the "loose money cycles" usually there is a higher trade deficit due to the monetary policy of allowing more credit with lower interest rates. As the rates increase the money will get tighter and fewer will be willing to lend the money as ownership becomes more attractive. This will trickle into the creating lower costs of production (labor, Environment, and other production factors) there-by leading to the improvement of trade balance positively.

3.3 The Source and Data Type
The study used the annual secondary data covering the period 2005-2013. This period has been chosen because data to be used in the trade balance function was likely to be available. Equation is estimated using ordinary least square (OLS) technique with selected data on Ghana. Unless otherwise specified, all the data has been drawn from the International Financial Statistics Year Book, the Central Bank of Ghana, world development indicators (WDI), publications and websites.
3.4 Data Analysis
Data entry and analysis were done by the use of a statistical software package called “R Console” and Microsoft-Excel (2010).

3.5 Review of Statistical Technique
When several measurements are made on the dependent variable, y at the same value of the controlled variable x, then the result will form a distribution. The curve which join the means values of these distribution is called regression curve of y on x. The problem of finding the most suitable form of equation to predict one variable from the values of one or more other variable is called the problem of regression.(Statistics for technology, a course in applied statistics, Christopher Chatfield, third edition London).

3.5.1 Multiple Regressions
In multiple linear regressions, we have single criterion variable (y) and multiple predictor variables (x_i). The multiple regression equation contains a regression coefficient (b_i) for each predictor variable and the regression constant a.

3.5.1.1 The Geometry of Multiple Linear Regressions
When developing the bivariate regression equation, we fitted the line (y = bx + a) to the scatter gram of points. The regression equation was determined using the least square criterion, which requires that \(\sum(Y - \hat{Y})^2\) be minimize that is the sum of the square differences between the actual Y scores and the predicted Y score be minimum. It is relatively easy to visualize this regression equation fitted to the scatter gram in two dimensions. However the geometry of multiple regressions is more difficult to visualize. Consider the situation in which we have one criterion variable (y) and two predictor variables (X_1 and X_2). This regression equation would have the form; 
\[\hat{Y} = b_1x_1 + b_2x_2 + a.\] In this situation, there are three variables each individual would have three scores and these three could be represented by a point in three dimensions. The next step in developing the geometry of multiple linear regression would be fit a plane to this mass of point, the three dimensional space. This process is similar to fitting the regression line to scatter gram in the two dimensional space using the least square criterion, that is where \(\sum(Y - \hat{Y})^2\) is a minimum. For two predictor variable or more variable case, the predicted value (\(\hat{Y}\)) is computed using the regression equation. The
regression coefficient $b_1$ is the slope of this plane as it intercepts the $Y$, $X_1$ plane, the regression coefficient $b_2$ is the slope of this plane as it intercept the $Y$, $X_2$ plane. The regression constant ($a$) is point where the regression plane intercept the $Y$ axis. The geometry of the two predictor variable case, since we live in three dimensional world we can extend the reasoning but we cannot visualize the geometry, when there are more than two predictor variable. If we have three predictor variable ($x_1$, $x_2$ and $x_3$) we would fit a three dimensional solid called hyper plane, to the mass of points in the four dimensional space. Thus for the case of $k$ predictor variables, we would fit a $k$-dimensional hyper plane to the mass of points in $k+1$ dimensional space. Regardless of number of predictor variables, the least square criterion is used in the process of fitting the hyper plane to the mass points.

To explain or predict the behavior of certain dependent variable using more than one predictor variable, we use multiple linear regression model. Multiple regression analysis enables us to consider more factors and thus obtain better estimate.

3.5.1.2 Multiple Regression Model

The equation that describes how $Y$ is related to the independent variables $y_1$, $y_2$, $y_3$ …..$y_p$ and error term is called is called the regression model.

The multiple regression model is given $Y = B_0 + B_1y_1 + B_2y_2 + ... + B_py_p + \epsilon$.

Where $p=$ number of independent variables
$B_0$, $B_1$, $B_2$………….. $B_p$ is referred to as the parameters of the model. The error term “$\epsilon$” accounts for the variability in $y$ that cannot be explain by the linear effect of $p$ independent variables.

3.5.1.3 Multiple Regression Equation

One of the assumptions made here is the mean or expected of $\epsilon$ is zero. As a result of this assumption, the mean or expected value of $y$ denotes $E(Y)$ is equal to $B_0 + B_1X_1 + B_2X_2 + ... + B_pX_p$. The multiple regression equation is $E(Y) = B_0 + B_1X_1 + B_2X_2 + ... + B_pX_p$

The value of $B_0$, $B_1$, $B_2$………….. $B_p$ are not known so we take simple random sample and compute sample statistics $b_0$, $b_1$, $b_2$ ………..$b_p$ that are used as point estimators.
3.5.1.4 Estimated Multiple Regression Equation

The estimated multiple regression equation is \( \hat{Y} = b_0 + b_1 x_1 + b_2 x_2 + \ldots + b_p x_p \).

Where \( \hat{Y} \) = estimated value of the dependent variable.

\( b_0, b_1, b_2 \ldots \ldots b_p \) is the estimate of \( B_0, B_1, B_2 \ldots \ldots B_p \).

3.5.1.5 Least Square Method

The least square method is a procedure for using sample data to compute an estimated regression equation, specifically values for \( b_0, b_1, b_2 \ldots \ldots b_p \). Values are found for \( b_0, b_1, b_2 \ldots \ldots b_p \) that minimize the sum of the squares of the deviation between the observed values of \( Y_i \) and the estimated value \( \hat{Y} \). The least square criterion is \( \text{SSE} = \min \Sigma (Y_i - \hat{Y}_i)^2 \).

Where \( Y_i \) = observed value of the dependent variable for the \( i^{th} \) observation.

\( \hat{Y}_i \) = estimated value of the dependent variable for the \( i^{th} \) observation.

The formulas for the regression coefficient \( b_0, b_1, b_2 \ldots \ldots b_p \) involves the use of matrix algebra.

The first thing to demonstrate in multiple regressions is how to determine whether the overall model is satisfactory. We begin by summarizing a regression analysis in an analysis of variance (ANOVA) table.

3.5.1.6 The Summary ANOVA Table

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of freedom</th>
<th>Sum of squares</th>
<th>Means squares</th>
<th>F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>k</td>
<td>SSR</td>
<td>MSR</td>
<td>MSR/MSE</td>
</tr>
<tr>
<td>Residual</td>
<td>n-k-1</td>
<td>SSE</td>
<td>MSE</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>n-1</td>
<td>SST</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Where \( n \) = number of observation

\( K \) = number of independent variables

\( \text{SST} \) = Total sum of squares

\( \text{SSy} = \Sigma (Y - \hat{Y})^2 = \Sigma Y^2 - \frac{(\Sigma Y)^2}{n} \)
SSE (sum of squares error) = \sum(Y - \hat{Y})^2
SSR (sum of squares for regression) = \sum(\hat{Y} - \bar{Y})^2 \quad OR
SSR (sum of squares for regression) = SST - SSE
MSR = mean square for regression = \frac{SSR}{K}
MSE (mean square for error) = \frac{SSE}{N-K-1}

3.5.1.7 Interpretation of Coefficients
We interpret each coefficient as follows; \( b_1 \) represent an estimate of change in \( Y \) corresponding to a one unit increase in \( y \) when all other independent variables are held constant.

3.5.1.7 Multiple Regression Coefficient of Determination
The multiple coefficient of determination provides a measure of the goodness of fit for the estimated regression equation. \( R^2 \) is the proportion of the variability in the dependent variable that can be explained by the estimated regression equation. The multiple coefficient of determination, \( R^2 \) is computed using the formula; \( R^2 = \frac{SSR}{SST} \)

3.5.1.8 Adjusted Coefficient of Determination
If the variable is added to the model, \( R^2 \) becomes larger even if the variable added is not statistically significant. The adjusted multiple coefficient of determination compensate for the number of the independent variable in the model. The adjusted multiple coefficient of determination is computed as follows;
\[
R^2 = 1 - (1 - R^2) \frac{n-1}{n-p-1}
\]
Where \( n \) = number of observation, \( p \) = number of independent variables.

3.5.1.9 Assumption about the Error Term
- The error \( \varepsilon \) is a random variable with mean or expected value zero. \( E(\varepsilon) = 0 \)
- The variance of \( \varepsilon \) is denoted by \( \sigma^2 \) and is the same for all of the independent variables
- The values of \( \varepsilon \) are independent.
• The error $\epsilon$ is normally distributed random variable reflecting the deviation between the $y$ value and the expected value of $y$ given by $B_0 + B_1X_1 + B_2X_2 + \ldots + B_pX_p$.

3.5.1.10 Testing for Significance

In multiple regression, the $t$ and $f$ tests have different purposes:

The $F$-test determines whether there is a significant relationship between the dependent variable and the set of all independent variables (a test for overall significance).

A separate $t$-test is conducted for each of the independent variables. (A test for individual significance)

• **F-Test**

  **Hypothesis:**
  $H_0: \beta_1 = \beta_2 = \ldots \beta_p = 0$
  $H_1$: one or more of the parameters is not equal to zero.

  **Test Statistic** $F = \frac{MSR}{MSE}$

  **Rejection Rule:** Using test statistic: Reject $H_0$ if $F > F_\alpha$ where $F_\alpha$ is based on an $f$ distribution with p.d.f in the numerator and $(n-p-1)$ degrees of freedom (df.) in the denominator.

  Using $p$-value: reject if $p$-value $< \alpha$.

• **T-Test**

  **Hypothesis:** $H_0: \beta_i = 0$
  $H_1: \beta_i \neq 0$

  **Test Statistic** $t = \frac{b_i}{s(b_i)}$

  **Rejection Rule:** Using test statistic reject $H_0$ if $t < t_\alpha/2$. where $t_\alpha/2$ is based on a $t$ distribution with $(n-p-1)$ degrees of freedom. Using $p$-value: reject $H_0$ if $p$-value $< \alpha$. 

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CHAPTER FOUR
ANALYSIS AND DISCUSSION OF FINDINGS

This chapter presents the research analyses and discussion of findings needed to meet the purpose of the study. A statistical software package called “R Console” was used to run the data and the following output was generated.

4.1 Analysis

Table 4.1: Output of Regression Analysis

| Coefficients:       | Estimate | Std. Error | t value | Pr(>|t|) |
|---------------------|----------|------------|---------|---------|
| (Intercept)         | 8.44E+10 | 5.68E+10   | 1.485   | 0.0276  |
| FDI                 | -2.09E+00| 1.75E+00   | -1.193  | 0.0355  |
| GE                  | -4.99E+08| 2.05E+08   | -2.434  | 0.0135  |
| NY                  | -3.86E+00| 2.52E+00   | -1.533  | 0.0265  |
| HCE                 | 5.71E-01 | 6.09E-01   | 0.937   | 0.0448  |
| REX                 | -6.56E+08| 4.84E+08   | -1.357  | 0.0308  |
| I                   | -3.15E+08| 2.29E+08   | -1.375  | 0.0303  |

Residual standard error: 562300000 on 2 degrees of freedom
Multiple R-squared: 0.9671, Adjusted R-squared: 0.8684
F-statistic: 9.799 on 6 and 2 DF, p-value: 0.009548

Analysis of Variance Table

Response: Balance of trade

Table 4.2: Output of Analysis of Variance

<table>
<thead>
<tr>
<th>Factors</th>
<th>Df</th>
<th>Sum Sq.</th>
<th>Mean Sq.</th>
<th>F value</th>
<th>Pr(&gt;F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI</td>
<td>1</td>
<td>1.39E+17</td>
<td>1.39E+17</td>
<td>0.4393</td>
<td>0.20201</td>
</tr>
<tr>
<td>GE</td>
<td>1</td>
<td>1.49E+19</td>
<td>1.49E+19</td>
<td>47.1154</td>
<td>0.01621</td>
</tr>
<tr>
<td>NY</td>
<td>1</td>
<td>9.30E+18</td>
<td>9.30E+18</td>
<td>29.4243</td>
<td>0.00879</td>
</tr>
<tr>
<td>HCE</td>
<td>1</td>
<td>2.60E+19</td>
<td>2.60E+19</td>
<td>82.2906</td>
<td>0.01031</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
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<td>------</td>
<td>------</td>
<td>---------</td>
</tr>
<tr>
<td>REX</td>
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<td>1.92E+19</td>
<td>1.92E+19</td>
<td>60.6054</td>
<td>0.00983</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>5.97E+18</td>
<td>5.97E+18</td>
<td>18.8983</td>
<td>0.03029</td>
</tr>
<tr>
<td>Residuals</td>
<td>2</td>
<td>6.32E+18</td>
<td>3.16E+17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Signif.codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

The table above shows unit root tests. The notations: (FDI),(GE),(NY),(HCE),(REX),(I), indicate respectively the Foreign Direct Investment, Government Expenditure, Net income, Household Consumption Expenditure, Real Exchange Rate and Inflation.

From the results of regression in table 1, it was found that the adjusted R-squared is (0.87) which is significant to explain the good fitness of the model, the overall significance of the model at 5 percent is shown by F-test result with a prob.(0.09548) indicate that the sign of the absence of serial correlation. The results identified that all variables are found to be significant at 5 percent level and had the correct sign as hypothesized these variables (factors) are the, the Real Exchange rate, Household consumption expenditure, Government Expenditure, Inflation, and Net income. Except Foreign direct investment the only variable that was found to be insignificant. Specifically the foreign direct investment had negative coefficient of -2.09E+00 implying that a decrease of the foreign direct investment by 5 percent would lead to a reduction of trade balance by 2.09E+00.

Household consumption expenditure had a positive significant sign implying that an increase in Household consumption expenditure by 5 percent would increase trade balance by 5.71E-01. Government expenditure had -4.99E+08 implying an increase of Government expenditure by 5 percent would lead to a deterioration of trade balance by -4.99E+08.

A rise in Net income by 5 percent would lead to the deterioration of trade balance by -3.86E+00

Again a rise in inflation by 5 percent would lead to the deterioration of trade balance by -3.15E+08 and finally exchange rate had -6.56E+08 indicate that an increase of exchange rate would result in the decrease in trade balance by -6.562E+08.
The intercept on the other hand as indicated in table 1 implies that, all things being equal, if the estimates of these factors considered were zeros, then Ghana’s balance of trade would be $8.44\times10^{10}$.

From table 1.1, the $p$-values of FDI, GE, NY, HCE, REX and I were compared to the significant value (Signif. Code = 0.05) and GE, NY, HCE, REX, I were found to be significant except FDI which was insignificant.

Based on the specific objective 2 stated in chapter one, the following outputs were generated using Microsoft-Excel, 2010. In reference to the World Bank data, Nigeria was found to have a surplus balance of trade and study sought to limit its comparisons to that of Nigeria.

Below is the outcome:

![Inflation Rate of Ghana and Nigeria](image)

Source: World Bank Data

**Figure 1: Inflation Rate of Ghana and Nigeria**

The figure 1 above shows the inflation rate of Ghana and Nigeria. It was observed that both countries experienced ups and downs in their inflationary patterns for the period under study. However Nigeria experienced deflation (-4.3) in 2009. Ghana throughout the period under consideration had double digit inflation with Nigeria having both single and double digits.
Figure 2: Real Exchange Rate of Ghana and Nigeria

The figure 2 shows the exchange rate between Ghana and Nigeria, it clearly indicated that the exchange rate of Ghana was higher as compared to that of Nigeria throughout the period under study.

Figure 3: Government Expenditure Rate for Ghana and Nigeria

The figure 3 above indicate that Nigeria’s government expenditure rate was having low values and centered around 9.0 as compared to that of Ghana. However it was seen that between 2006 and 2009 Ghana’s expenditure experience some stability. Whiles Nigeria experienced some stability from 2010 to 2013.
The figure 4 shows that the household consumption of Ghana was very low as compared to that of Nigeria. While Nigeria was receiving larger values for household consumption, Ghana was having low figures.

Source: World Bank Data

**Figure 4: Household Consumption Expenditure for Ghana and Nigeria**

The Figure 5 above show that Ghana was having stable value of Net income which were negative while that of Nigeria was having large negative values and was unstable.

Source: World Bank Data

**Figure 5: Net income for Ghana and Nigeria**

The results of this study collaborate with that of the sixteenth researcher in chapter two’s literature review in only two variables namely Government expenditure and Household consumption expenditures which were the main determinant of trade.
balance in Tanzania. However in his study he also found the net income to be insignificant variable which makes the contradiction to this study, but it seems that these contradictory results can be explained by the inclusion of more variables that has been used in this study.

Foreign direct investment was found to be insignificant with a correct sign as hypothesized therefore was not included among the major determinants of trade balance in Ghana but this result collaborates with sixteenth researcher in his study who also got the negative insignificant and concluded that foreign direct investment devaluation is not the solution for promoting export in Tanzania. However the results collaborates with forth researchers in his study of the determinant of trade balance in Kenya who discovered that the Foreign direct investment was insignificant this implies that the independent variables jointly can influence the dependent variables and the adjusted $R^2$ value which is also significant with the value of 87 percent implying that the model was well specified and appropriate to determine the trade deficit in Ghana. Also Government Expenditure, Net income, Household Consumption Expenditure, Real Exchange Rate and Inflation were found to be the main determinants of Ghana’s balance of trade.

Finally this variable which shows deficit in Ghana was compared with surplus country (Nigeria). It was observed that both countries experienced ups and downs in their inflationary patterns for the period under study. However Nigeria experienced deflation (-4.3) in 2009. Ghana throughout the period under consideration had double digit inflation with Nigeria having both single and double digits.

It was clearly indicated that the exchange rate of Ghana was higher as compared to that of Nigeria throughout the period under study. Moreover Nigeria’s government expenditure rate was having low values and centered around 9.0 as compared to that of Ghana. However it was seen that between 2006 and 2009 Ghana’s expenditure experience some stability. While Nigeria experienced some stability from 2010 to 2013.

Again the household consumption of Ghana was very low as compared to that of Nigeria. While Nigeria was receiving larger values for it household consumption, Ghana was having low figures.
Finally on Net income, Ghana was having stable value of Net income which were negative while that of Nigeria was having large negative values and was unstable.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS
This chapter presents in summary form, the results of the statistical analysis (conclusion) and recommendations.

5.1 Conclusion
The study is highly motivated by the trade deficit that has existed for so many years in Ghana. First the Regression analysis was conducted and the results showed that all the variables were significant at 5 percent level and had the correct sign as hypothesized, the table 1.1 also gave an adjusted $R^2$ value of 0.87 which implies that almost 87% of the variation in the balance of trade was explain by the regression model, (that is on the variables (factors); Real Exchange rate, Householdconsumption expenditure, Government expenditure, Inflation and Net income). Except Foreign direct investment which was the only variable that wasfound to be insignificant. In effect Real Exchange rate, Householdconsumption expenditure, Government expenditure, Inflation and Net income were some of the variables which contribute to trade deficit in Ghana.
On comparing these factors with that of a surplus country say Nigeria, it was observed that both countries experienced ups and downs in their inflationary patterns for the period under study. Ghana throughout the period under consideration had double digit inflation with Nigeria having both single and double digits. It was also clear that Ghana needed more of its resources in terms of its exchange, whiles Nigeria on the other hand needed few of its resources for her exchange. Moreover Nigeria’s government expenditure rate was having low values and centered around 9.0 as compared to that of Ghana. However it was seen that between 2006 and 2009 Ghana’s expenditure experience some stability. Whiles Nigeria experienced some stability from 2010 to 2013. Again Ghana’s household consumption values was very low under the period of review whiles that of Nigeria had larger values and lastly net income Ghana was stable and experiencing only negative values whiles that of Nigeria was unstable and also having negative values over the period. These comparisons showed why Ghana has been facing trade deficit over the years and Nigeria is not.

5.2 Recommendations

With regards to the above findings, the following recommendations should be given ultimate attention by Policy makers as well as Stakeholders;

- Policy formulation should base on these out listed factors in order to improve the trade balance in Ghana. Some policy advice like continuation of a more conducive investment climate in Ghana is important to encourage more multinational companies to come and invest in the country especially those with that target to export from the country.
- The reduction of both government and household consumption expenditure will be the best move to make in the economy to improve trade balance.
- More facilities and opportunities for the people to get more education are necessary to increase the number of educated people in the country that can increase the production level hence improve the trade balance.
- Also other good measures of currency stabilization are necessary to improve trade balance.
- Finally related researches should be conducted in order to explore more on the subject matter.
REFERENCES


5. Berlin Ohlin, 1933 Interregional-and-International-Trade


APPENDIX
PRESBYTERIAN UNIVERSITY COLLEGE, GHANA
OKWAHU CAMPUS, ABETIFI
DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY & MATHEMATICS
R’S OUTPUT

Factors=read.table("factors.txt",header=T)

> factors

Data on Selected Factors (Ghana)
<table>
<thead>
<tr>
<th>Year</th>
<th>BT</th>
<th>FDI</th>
<th>GE</th>
<th>NY</th>
<th>HCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>-130986599</td>
<td>8688836727</td>
<td>102.4</td>
<td>50.745T</td>
<td>-1104609521</td>
</tr>
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<td>2006</td>
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<td>20256210361</td>
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</tr>
<tr>
<td>2008</td>
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<td>24321395965</td>
<td>101.9</td>
<td>74.973</td>
<td>-3327428936</td>
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<tr>
<td>2009</td>
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<td>20123461599</td>
<td>93.8</td>
<td>82.064</td>
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</tr>
<tr>
<td>2010</td>
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<td>25058961234</td>
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<td>87.701</td>
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</tr>
<tr>
<td>2011</td>
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<td>24312241624</td>
<td>94.9</td>
<td>95.045</td>
<td>-3503939000</td>
</tr>
<tr>
<td>2012</td>
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<td>19282522344</td>
<td>88.9</td>
<td>102.764</td>
<td>-4631530000</td>
</tr>
<tr>
<td>2013</td>
<td>-1132857795</td>
<td>28373678641</td>
<td>89.6</td>
<td>116.632</td>
<td>-5685100000</td>
</tr>
</tbody>
</table>

BT = factors$BT

> BT
[1] -1104609521 -1056074433 -2378784232 -3327428936 -1897165484 -2747340000
[7] -3503939000 -4631530000 -5685100000

> FDI = factors$FDI

> FDI
[1] 144970000 636010000 1383177930 2714916344 2372540000 2527350000 3222240000
[8] 3294520000 3227000000

> GE = factors$GE

> GE
[1] 15.3 11.2 11.6 11.2 11.7 10.4 16.6 21.0 16.6

> NY = factors$NY

> NY
[7] -1255902504 -2146476793 -1132857795

> HCE = factors$HCE

> HCE
[1] 8688836727 16875189028 20256210361 24321395965 20123461599 25058961234
> REX = factors$REX
> REX
[1] 102.4 107.8 107.1 101.9 93.8 100.0 94.9 88.9 89.6

> I = factors$I
> I
[1] 50.745 56.288 63.464 74.973 82.064 87.701 95.045 102.764 116.632

myfit = lm(BT ~ FDI + GE + NY + HCE + REX + I)
> myfit

Call:
lm(formula = BT ~ FDI + GE + NY + HCE + REX + I)

Coefficients:
(Intercept) FDI GE NY HCE REX I
8.439e+10 -2.088e+00 -4.994e+08 -3.862e+00 5.711e-01 -6.562e+08
-3.146e+08

> summary(myfit)

Call:
LM(formula = BT ~ FDI + GE + NY + HCE + REX + I)

Residuals:

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> anova(myfit)