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硕士学位论文

原油冲击与股票市场表现之间的关系：来自拉丁美洲新兴市场的证据

The relationship between crude oil shocks and stock market performance: Evidence from Latin American emerging markets

Esteban Andres Suarez Cobos

指导教师姓名 YingXing Li

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摘要

大多数新兴市场经济严重依赖商品市场，特别是石油，来促进经济发展，因此，研究石油冲击对这些新兴经济体的影响是一个非常重要的课题。本文利用 1995 年 1 月至 2010 年 12 月的月度数据研究了原油市场和拉丁美洲新兴股票市场指数之间的关系。特别的是本文考虑了三种不同类型的石油冲击，包括需求冲击、供给冲击和石油价格特定冲击，同时控制了汇率和短期利率，以便更好的刻画原油市场冲击与新兴拉美市场指数的动态关系。我们用新兴市场 EM 拉丁美洲指数来衡量股票市场表现。我们估计了 VAR 模型，并进行了广义脉冲响应函数分析和方差分解。

从广义脉冲响应函数结果来看，石油需求、石油价格和石油生产的冲击均对拉丁美洲股市产生一个正的影响，但该影响也逐步消失。此外，拉丁美洲股市表现与美元贸易加权汇率指数和美国短期利率之间存在负相关关系，这可能是由于美元和原油价格之间存在反向关系，而美元利率和股票市场投资也存在反向关系。最后，方差分解结果表明，来自石油生产的冲击对 EM 拉丁美洲指数的变动解释贡献最大，其原因是这些新兴市场的工业生产和经济状况均依赖于石油生产和出口。

研究结果表明拉美新兴经济股市表现与石油市场的冲击存在紧密联系。该研究或能有利于更好地了解地区经济发展状况，并为进一步的研究及政策制定提供参考。

关键词：拉丁美洲股市；新兴市场；石油价格；VAR 模型

Abstract

The economic development, of many emerging markets, relies heavily on commodity markets, especially the crude oil market. Hence, it is an important issue to understand the impact of crude oil shocks on these economies. This thesis investigates the relationship between crude oil shocks and the performance of the Latin American stock index, using the monthly data from Jan. 1995 to Dec.2010. In particular, we consider three types of oil shocks; demand shock, supply shock, and price shock, with the control of variables like the U.S exchange rate and the short term interest rates, to understand their dynamic impacts on the Emerging Markets (EM) of Latin America index. We conduct a Vector Autoregression (VAR) regression along with generalized impulse response function analysis and variance decomposition.

The results from the generalized impulse response function suggest a positive relationship between the EM Latin America index and a positive shock to oil demand, oil price, and oil production, followed by a gradual decrease over time. Additionally, the results show a negative relationship between the EM Latin American index and the U.S dollar Trade Weighted exchange rate index as well as the U.S short term interest rates. Furthermore, the results from the variance decomposition suggest that oil supply shocks account for the greatest amount of variance on the EM Latin America index, potentially attributed by the oil dependence of emerging markets for both industrial production and export revenue.

In general, our findings reveal a strong dependence between the oil market and the economies that constitute the EM Latin America index, leading to a better understanding of the economics of this region and providing a starting point for further study and eventual policy applications.

Key Words: Latin America; Emerging Markets; Oil Prices

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Chapter 1: Introduction

Since the second industrial revolution at the beginning of the 20th century, the importance of oil, as a source of energy, has not ceased to grow. From a chemical used to light lamps in the 19th century to one of the most used power sources of the 21st century, oil has become an important factor in determining the economy of several countries. Emerging, energy inefficient economies and oil-commodity exporters like Latin America are especially dependent in oil for both revenue and industrial production.

In this thesis, we focus on the importance of oil to the emerging markets of Latin America. The Latin American economy has been tied to the relationship between the price of oil and the market for decades. As in, the energy crisis of the 70's, where interest rates hit almost zero and oil prices sky rocketed increasing the wealth of oil exporting nations and creating a wave of investment and loans for emerging markets in Latin America. However, the economies of the region were affected by the "lost decade" in the 80's, where excessive foreign debt, from the previous decade, and deteriorating exchange rates caused governments of the region to default on their debt obligations¹. The relationship between oil shocks and market performance has been of extreme importance for Latin America both historically and currently and it has become a topic of interest for investors and government officials alike.

Our study analyzes the relationship between oil and market performance and covers the most important countries in Latin America, such as Brazil, Colombia, Chile, Peru, and Mexico. Statistics show the relevance and importance that Latin America has on the World economy. Data shows that as of 2015 world GDP was approximately 73.4 trillion, with Latin America and the Caribbean contributing with

¹ Source: <http://www.federalreservehistory.org/Events/DetailView/46>

4.2 trillion or about 5.72 % of the world GDP², as can be seen in Figure 1 below. Even though the economic growth of Latin American countries has slowed down in recent years, they still perform better than most of the developed economies. According to recent forecasts, the economic growth rate of developed economies is believed to increase from the 2015 estimate of 1.9% to 2.1% in 2016 and hold that steady 2.1% increase into 2017. On the contrary, economic growth in emerging markets, including Latin America, is forecasted to increase from the 2015 estimate of 4.0% in 2015 to 4.3% in 2016 and 4.7% in 2017³.

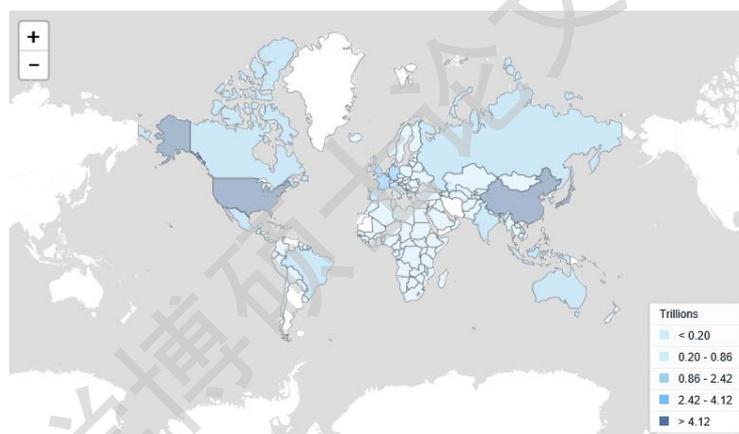


Figure 1: World GDP in 2015 Trillions of USD

Source: World Bank (2016)

Latin America is starting to rise up in the world economy and making a bigger impact each day. It is important to understand the link between the economic performance of Latin America and the price of oil in order to provide with eventual policy implications.

² Source: <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD>

³ Source: <http://www.imf.org/external/pubs/ft/weo/2016/update/01/index.htm>

1.1: Economic Structure of Latin America

The economic structure of the countries that constitute the index can help provide with a better understanding about the link between market performance and oil price. The Latin American economy is divided into three main sectors: agricultural sector, which encompasses farming of plants and animals, the industrial sector, which constitutes the production of goods, including fuels, and the service sector, which is concerned with non-material interactions among individuals. Figure 2 represents the economic structure for the year 2010.

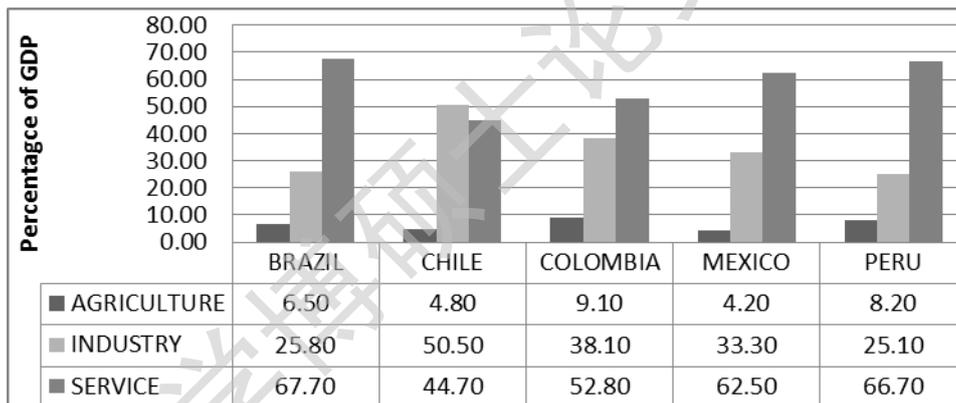


Figure 2: GDP by Sector for 2010

Source: CIA, World Factbook, 2010

To understand the dynamics of the Latin American index, one can look closely at the industrial sector, which accounts for a significant percentage of the overall GDP of the countries under study. The industrial sector of these countries seems to follow a common trend and there are several similarities between industries.

Brazil's industrial sector is the most advanced in Latin America and is diverse. The Brazilian industry covers several niches, such as textiles, construction materials, and technology. Additionally, the industry of the nation focuses on the energy

industry. Brazil was not only one of the leading producers of hydroelectric power in 2010, but also one of the 9th largest oil producers of the world for that same year⁴. Chile's industrial sector revolves mostly around the export of commodities, especially copper. However, the oil industry is developing and starting to expand⁵. The Colombian industry is well diversified; however, there is a certain focus on the energy industry, especially oil. Colombia's fossil fuel exports accounted for 60.40% of all merchandise exports in 2010⁶. Mexico's 2010 economy was known for their technology sector, especially car parts and small appliances, however, the main focus revolved around the oil industry. During 2010, the oil industry was the largest in the nation and in that same year, Mexico was also the 7th biggest producer of oil in the world⁷. Lastly, Peru's main industries are focused on the commodity sector. During 2010, the nation attributed about one eighth of its GDP to the rents that were generated from the sale of commodities⁸.

The economies of Latin America rely on raw materials as a good portion of income and are susceptible to commodities prices⁹. In 2013, Brazil's total natural resource rents as a percentage of GDP was about 5.33%, Chile's was about 16.29%, Colombia's was about 10.09%, Mexico's was about 7.73%, and Peru was about 9.88%¹⁰, as seen in Figure 3.

⁴ http://www.economywatch.com/world_economy/brazil/industry-sector-industries.html

⁵ http://www.economywatch.com/world_economy/chile/industry-sector-industries.html

⁶ http://www.economywatch.com/world_economy/colombia/industry-sector-industries.html

⁷ http://www.economywatch.com/world_economy/mexico/industry-sector-industries.html

⁸ <http://data.worldbank.org/indicator/NY.GDP.TOTL.RT.ZS?view=chart>

⁹ Source: <http://www.wsj.com/articles/south-america-suffers-from-end-of-commodities-boom-1460487125>

¹⁰ Source: <http://data.worldbank.org/indicator/NY.GDP.TOTL.RT.ZS?view=chart>

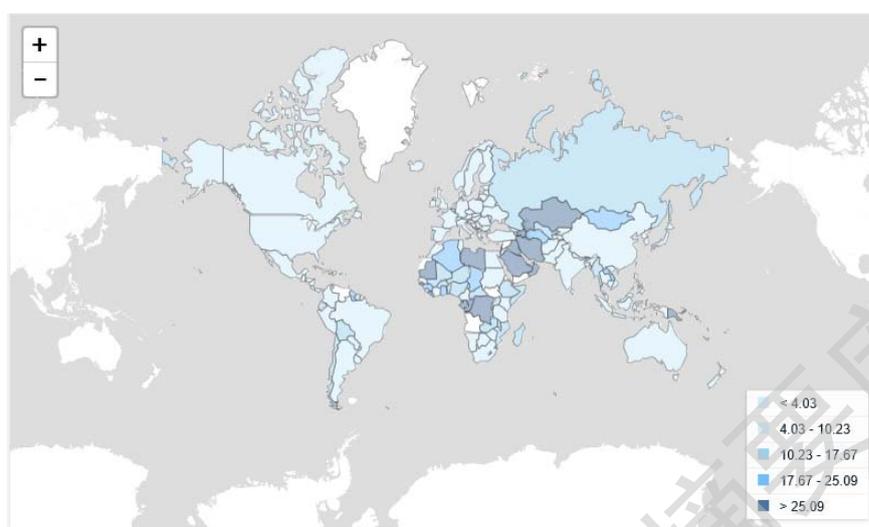


Figure 3: Total natural resource rents as a percentage of 2014 GDP

Source: World Bank (2016)

Recent research has shown that South American countries that rely heavily on commodity prices, such as the price of oil, are facing hardships after the end of the commodity price boom. A slow manufacturing sector in Asia has reduced the demand for exports from South America and, at the same time, a sharp decline in the price of raw materials has shocked the exchange rates of exporting countries¹¹. Although economic decline varies from country to country, there persists a common trend, which is a decline of commodity prices¹².

The importance of the industrial sector, especially of the oil industry, when compared to other industries or to the remaining two sectors, is accentuated by the fact that natural resources are controlled by the government. Brazil's oil industry is controlled by Petrobras, the state oil company. Petrobras is mostly owned by the government, who controls 51% of the company, and is the only company with

¹¹ Source: <https://www.imf.org/external/spanish/pubs/ft/reo/2016/whd/pdf/wreo0416exesums.pdf>

¹² Source: <http://www.imf.org/external/pubs/ft/reo/2014/whd/eng/pdf/wreo1014.pdf>

exclusive rights to explore, produce, refine, and distribute oil¹³. In Chile, the Empresa Nacional del Petroleo covers 40% of the energy demand of Chile¹⁴. In Colombia, the Empresa Colombiana de Petroleos is the state owned company responsible for 100% of all hydrocarbon reserves in the republic¹⁵. In addition, Mexico's oil industry is nationalized and the national company, Pemex, retains exclusive rights to all oil exploration, production, and commercialization in Mexico¹⁶. The Mexican government relies heavily on taxes paid by Pemex for fiscal revenue, which according to 2013 data, contributed with a third of the federal revenue for that year¹⁷. Lastly, Peru's oil production is managed by PetroPeru, who possesses the full rights for exploration, exploitation, refining, distribution, and commercialization of the national oil resources¹⁸.

Evidence from Latin America suggests that commodities are controlled by the government and are an important source of revenue, used to finance social programs. For so, price volatility in the oil sector can pose a serious threat to the economic development of the region.

¹³ <http://www.petrobras.com.br/en/about-us/>

¹⁴ <http://www.enap.cl/pag/100/776/historia>

¹⁵ <http://www.ecopetrol.com.co/wps/portal/es/ecopetrol-web?ChangeLang=es>

¹⁶ <http://www.pep.pemex.com/Paginas/Informacion.aspx>

¹⁷ <http://www.reuters.com/article/mexico-reforms-pemex-idUSL1N0IB0OI20131030>

¹⁸ <http://www.petroperu.com.pe/portalweb/Main.asp?Seccion=40>

1.2 Energy Structure of Latin America

Aside from Latin America's dependence on commodities as a source of revenue, energy price volatility plays an equally important role in the economic development of the region. Energy is considered as a crucial factor for economic activity and growth. The relationship between an increase in economic growth and demand for energy is stronger in those economies in development. World energy consumption is forecasted to rise by 56% between the years of 2010 to 2040, with most of the growth coming non-OECD countries¹⁹. Fossil fuels, like coal, oil, petroleum, and natural gas, account for the largest source of energy for Brazil, Chile, Colombia, Mexico, and Peru²⁰ for the last three years that were available. As can be seen in figure 4.

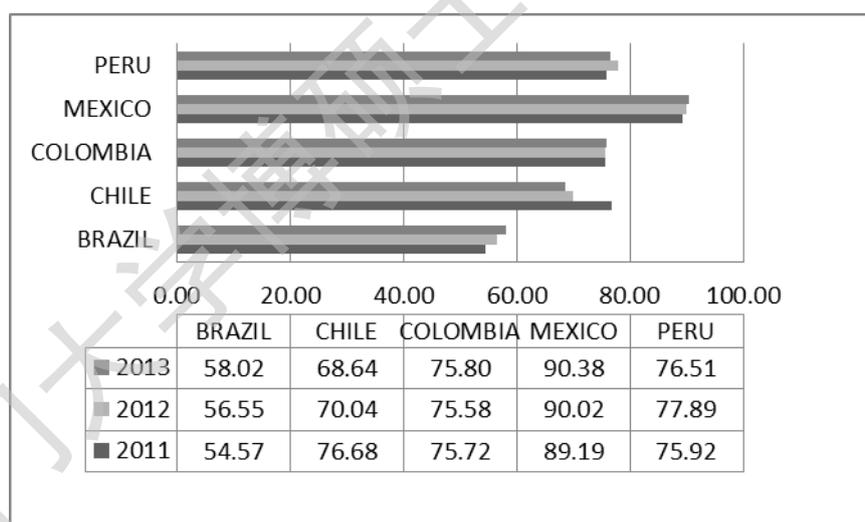


Figure 4: Fossil fuel energy consumption (% of total)

Source: World Bank (2016)

¹⁹ <http://www.eia.gov/todayinenergy/detail.cfm?id=12251>

²⁰ Source: <http://data.worldbank.org/indicator/EG.USE.COMM.FO.ZS/countries/1W?display=default>

With oil as the primary source of energy, recent developments such as the disagreement of a production ceiling by the OPEC as well as the introduction of U.S. shale oil have caused volatility in the oil market and have taken a toll in the world economy. Declines, due to speculation or increased competition or oversupply, have caused a decrease in the price of oil and caused a mixed effect on the world economy. This constant decline in the price of oil is double edge sword benefiting those economies that are net oil importers and hurting those that are net oil exporters. Latin American economies that rely heavily in the oil industry as a source of income and for sustaining social programs and economic development are affected the most by the decrease in crude oil prices²¹.

As one can see, the global business field is changing and new emerging and transition economies are appearing and starting to make a significant impact in the economy alongside developed markets. However, access to financial markets and alternative energy are not readily available for some of those economies in development. As a result, dependence on oil exports for revenue and oil price for industrial production represent a serious factor in determining market performance.

There have been several researches analyzing the link between oil price and the stock market performance of specific economies or countries. For example; Basher and Sadorsky (2006) study on the link between oil prices and emerging stock market returns, Fang and You (2014) study about the impact of oil price shocks on the largest NIEs countries, and Jung and Park (2011) study on South Korea and Norway's stocks response to oil price shocks, just to name a few. However, there has not been much study about the relationship between oil, exchange rate, and interest rate shocks on Latin American stock markets. Moreover, there has been plenty of research about the relationship of oil prices and stock market performance for different types of

²¹ Source: <http://www.economist.com/blogs/economist-explains/2014/12/economist-explains-4>

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