DOES THE MARKET PICK UP ON THE TOTAL VALUE ADDED TO
THE PERUVIAN COMPANIES BY A DEVALUATION OF THE
PERUVIAN NUEVO SOL?

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Abstract
The main goal of this paper is to test a form of market efficiency in the
Lima Stock Exchange (Bolsa de Valores de Lima). This study examines
how the individual stock prices of two selected companies are affected by
three standard deviation changes in the exchange rate between the
Peruvian Nuevo Sol and the US dollar. The main question that drives this
paper is whether the market picks up on the total value added to these
Peruvian companies by a devaluation of the Peruvian Nuevo Sol. Within
this overall goal, the first objective is to determine if there is a relationship
between the revenue and expense structure of the selected companies once
a three standard deviation in the exchange rate has taken place, and the
reaction of the market to these returns in the exchange rate. The findings
of this study suggest that, in reference to the companies studied, the
Peruvian, stock market does not impound instantly the impact that a
change on the exchange rate has in the value of these corporations.

Keywords
Currency markets, Exchange rates, Market efficiency, Event study.

A Study Of The Relationship Between Exchange Rate, Stock Prices, The Revenue And Expense Structure Of Peruvian Companies

The main goal of this paper is to test a form of market efficiency in the Lima Stock Exchange (Bolsa de Valores de Lima). This study examines how the individual stock prices of two selected companies are affected by three standard deviation changes in the exchange rate between the Peruvian Nuevo Sol and the US dollar. The main question that drives this paper is whether the market picks up on the total value added to these Peruvian companies by a devaluation of the Peruvian Nuevo Sol. Within this overall goal, the first objective is to determine if there is a relationship between the revenue and expense structure of the selected companies once a three standard deviation in the exchange rate has taken place, and the reaction of the market to these returns in the exchange rate. The findings of this study suggest that, in reference to the companies studied, the Peruvian, stock market does not impound instantly the impact that a change on the exchange rate has in the value of these corporations.

Goal

The main goal of this paper is to test a form of market efficiency in the Lima Stock Exchange (Bolsa de Valores de Lima, Peru). This study examines how the revenue and expense structure of two selected Peruvian companies are affected by a three standard deviation change in the exchange rate between the Peruvian Nuevo Sol and the US dollar, and analyzes whether the stock market picks up on the value added by the devaluation in the currency. A three standard deviation change in the exchange rate is considered an abnormal event. The day when this abnormal change occurred is the "event day" in this study.

Background

Numerous authors have established that exchange rate changes affect our overall economy either directly or indirectly. The direct impact on international corporations takes the form of translation, transaction, and economic exposure. The indirect impact is felt when corporations with purely national operations are affected by, for example, competitor's changes in prices, or changes in the needs of their customer base as a result of changes in the value of the currency.

International investors have to consider the impact of exchange rate changes on the value of their returns. Exchange rate changes affect the variability of returns from international operations and therefore add risk to international portfolios. A currency is risky because there is uncertainty about the timing and magnitude of a devaluation. Currency risk can be approximated by calculating the probability that the actual domestic purchasing power of a currency in the future will not be the same as the originally expected value. Exposure is what one has at risk; it can be negative (if it results in a loss of value) or positive (if it results in a gain of value).

The Purchasing Power Parity Theory (PPP) suggests that exchange rates adjust to make up for inflation differentials (and therefore price differentials) between countries. As a result, changes in exchange rates should not have any effect on the stock prices or the economy. Nevertheless, research has proven that PPP does not work very well in the real world. The reason is that time is a factor in changing buying patterns, there are information inefficiencies, trade distortions due to tariffs and quotas, and there is no perfect substitution for many products.

Mussa (1979) states that month-to-month changes in exchange rates exchange rates are not well correlated with month-to-month changes in relative purchasing power parities. Whenever an exchange rate undergoes (as in our case) a substantial change over a short interval of time, this change is almost always associated with significant divergence from relative purchasing power parity. Additionally, Mussa (1979) points out that looking at the 20s and 30s, when the exchange rates fluctuated freely, one can see that there is no basis for the belief that exchange rates adjust slowly and smoothly to correct "fundamental disequilibria." The magnitude of fluctuations may increase or decrease with the magnitude of disturbances to the world economy, but the smoothly adjusting exchange rate does not exist in reality.

The effects of exchange rate changes in the national economy are difficult to assess. This difficulty is mainly due to the relationship among interest rates, relative inflation, and exchange rates. For example, even if a devaluation of the home currency and a reduction of the real interest rate benefit domestic firms by stimulating exports and reducing the costs of financing within the country, this low interest rate can also have a negative impact by causing a reduction of foreign capital coming into the country. Therefore, in determining the effects of these three variables, one has to consider issues specific to each country such as comparative advantages, the balance of trade, and the relative importance of the current and capital accounts.

Similar considerations have to be made in reference to the effect of the firm's exposure to exchange rate uncertainty on the value of a firm. To approximate this impact, one has to determine which are the variables affecting the firm's economic and accounting exchange exposure as well as the cost of capital.

THE LIMA STOCK EXCHANGE

Peru is a Republic with a total estimated population of 22.2 million inhabitants, the fourth most populous country in South America. Like many other developing countries in South America, the main economic problem this country has faced is the rampant inflation. Nevertheless, as a result of President Fujimori's stabilization program, inflation has fallen from a high of 7,699.7 percent in 1990 to 39.5 percent in 1993, 15.4 percent in 1994 and 10.2 percent in 1995. Real interest rates have behaved erratically over the past years, but have been falling steadily during recent years. The nominal monthly interest rate on loans in Nuevos Soles has declined from 40 percent in September 1990 to 2.4 percent in January 1996.

In December 31, 1995, there were 238 companies listed on the Bolsa de Valores de Lima (the Lima Stock Exchange) with a market capitalization of $11.4 billion and an average daily trading volume of US$ 19 million for 1995. Direct foreign investment has risen from US$5.5 million in 1988 to US$1.61 billion in 1995. As of December 31, 1995, the ten largest companies in terms of markets capitalization represented approximately 79% of the Lima Stock Exchange's aggregate market capitalization.

Trading on the Lima Stock Exchange is conducted through an open outcry auction that takes place from Monday through Friday form 10:00 a.m. to 1:00 p.m. local time and is divided into two simultaneous sessions: the floor session and the over-the counter session. Trading of common and labor shares is done during the floor sessions. Trading of local bonds (including leasing bonds issued by Peruvian banks), short-term drafts, commercial paper, drafts accepted or guaranteed by listed companies and banks and repurchase operations is done during the over-the counter sessions.

The transactions during both sessions are executed through brokerage firms on behalf of their clients. Brokers submit their orders in accordance with written instructions, following the chronological order of the receipt. The orders specify the type of security ordered or offered, the amounts and the price of the sale or purchase, as the case may be. In general, share prices are permitted to increase or decrease up to 10% within a single trading day.

The General Index is composed of 56 shares issued by a variety of companies that are divided into nine different groups: banks, financial companies, industrial, mining, insurance, utilities, industrial (labor shares), mining (labor shares), and other. It has been calculated on a daily basis since December 1981; however, due to prior high inflation, the index has been reset several times, the last being on March 18, 1996. The selection of companies and their participation in the index depends on the volume traded in each stock during the last three months.

Additionally, the Peruvian stock market capitalization increased 135.3 percent, 93.3 percent, 60.5 percent and 42.5 percent in 1992, 1993, 1994, and 1995, respectively, in U.S. Dollar terms. Volume in the Peruvian market is highly concentrated. In terms of market capitalization, the ten largest companies represent 40% of the total traded value during 1995. Total traded volume has increased from US$ 734 million in 1992 to US$2.0 billion in 1993, US$4.1 billion in 1994, and US$5.3 billion in 1995. Average daily volume traded has increased from US$2.4 million in late 1991 to US$19 million in 1995.

EXCHANGE RATES

Fluctuations in the exchange rate between Nuevos Soles and Dollars will affect the net income of many corporations as well as the dollar equivalent of the Nuevo Sol price of the shares on the Lima Stock Exchange. Since March 1991, there have been no exchange controls in Peru and all foreign exchange transactions are based on free market exchange rates. However, during the last two decades, the Peruvian currency has experienced a significant number of large devaluations and Peru has consequently adopted and operated under various exchange rate control practices and exchange rate determination policies,

ranging from strict control over exchange rates to market-determination. Current Peruvian regulations on foreign investment allow the foreign holders of equity shares of Peruvian companies to receive and repatriate 100% of the cash dividend distributed by a company. Such investors are allowed to purchase foreign exchange at free market exchange rates through any member of the Peruvian banking system.

PREVIOUS RESEARCH

The literature review will summarize research done in the three major areas related to our study: market efficiency, the relationship between currency movements and stock market behavior, and stock prices and currency and future earnings. In reference to market efficiency, Brown et al. (1988) point out "rationality in financial markets implies that investors correctly use all available information in establishing security prices." One of the questions this research tries to address is how do market participants assimilate relevant data, and whether they consider that an abnormal change in the exchange rate (previously defined as a one-day three standard deviation change) is relevant data that needs to be taken into consideration when evaluating security prices.

The Efficient Market Hypothesis (EMH) claims: "the price of a security at any point is a noisy estimate of the present value of the certainty equivalent of its risky future cash flows." Although the EMH assumes that investors have rational expectations about the future, rationality does not imply that security prices react immediately to news. The full reaction could be unknown if there is incomplete information at the time of the event (as might be the case when there is an abnormal exchange rate change). The complete extent of the impact of news on stock prices may be uncertain and vary depending upon the specific event and on the specific market. For example, Haugen et al. (1985) conclude that the Mexican stock market is not as efficient as the US stock market due to the lack of appropriate informational channels that communicate financial news in an expeditious manner. Other research by De Bondt and Thaler (1985) demonstrate that investors "overreact" to news and must correct their original forecasts. Also, Cox et al (1996) document various stock return anomalies. These anomalies indicate that either the stock markets are not efficient or the models used to capture the risk-return relationship or stocks are misspecified.

In reference to currency movements and stock market behavior, Solnik (1984) points out that the relationship between currency movements and stock market prices is weak and it results as a consequence of the impact that changes in domestic interest rates have on both variables. Jorion (1991) presents evidence that the relation between stock returns and the value of the dollar differs systematically across industries. A significant positive exposure indicates that these industries tend to benefit from dollar depreciation. A significant negative exposure indicates that these industries tend to suffer from a depreciation of the dollar. Nevertheless, these findings do not suggest that exchange rate risk is priced in the stock market. Overall, the premium associated with foreign exchange exposure is found to be economically and statistically insignificant.

Adler and Dumas (1984) report that a study of fourteen currencies for the period of floating exchange rates 1919-1925 suggests a relationship between relative world price index changes

and exchange rate changes on a monthly basis. One can make the assumption that a devaluation will tend to increase the local currency price of competitive imports making the imports less likely to be substituted for locally produced goods. Adler and Dumas (1984) point out that even companies with purely national transactions can be affected by changes in the exchange rate if they provide services to a customer base whose activities are affected by exchange rate changes.

Goldberg (1990) found correlation between exchange rate movements and domestic investment for many US industries. Also, Bodnar and Gentry (1993) determined that the industry exposure to exchange rate fluctuations is independent of the overall markets' exposure. In their study of US, Canadian, and Japanese industries they found that approximately 1/3 of them had significant statistical exposure and that exchange rates affect traded and non-traded goods.

Donnelly and Sheehy (1995) observed a contemporaneous relation between the foreign exchange rate and the market value of large exporters. They also determined the existence of a weak lagged relationship that suggests that the stock market takes time to incorporate all the implications of foreign currency movements. They hypothesize that the more open the economy is, such as those of Japan, Canada, and UK, the more exposed they are to currency risk. On the contrary, the more closed an economy, such as in the case of US, the less responsive.

On the other hand, Bartov and Bodnar (1994) did not observe a significant contemporaneous correlation between the abnormal returns of their sample firms with international activities and changes in the dollar. Nevertheless, lagged changes in the dollar were determined to be a significant variable in explaining current abnormal returns. Again, these findings suggested that mispricing occurred. In 1995, Bartov and Bodnar further explored the relation between stock returns of firms with foreign currency positions and lagged exchange rates changes. Their findings indicate that only firms reporting using the dollar as the functional currency retain a significant relation between the lagged change in the dollar and the firm value. For companies that report using the foreign currency as the functional currency, this significant lagged relation disappears.

In a study of for nine developed countries for the period 1973-1982, Shapiro (1975) reports that the depreciation of the domestic currency has a small but significant positive impact in the stock price: a 10% depreciation is associated with a 1.1% stock appreciation. Within the same study, the findings on a country-by-country basis showed that the US reported the strongest reaction, whereas for other countries, results were smaller and varied. These varied reactions among countries might be explained by differences in the balance of payments structures, trade elasticity, and economic and monetary policies.

In reference to stock prices and current and future earnings, Bernard and Thomas (1990) present evidence consistent with a failure of stock prices to reflect fully the implications of current earnings for future earnings. Specifically, the three-day price reactions to announcements of earnings for quarters t_{+1} through t_{+4} are predictable, based on earnings of quarter t. This relates to our paper in the sense that an abnormal change in the exchange rate may alter the cash flows of a firm with international exposure and, therefore, the corporation's future earnings.

Jorion (1990) analyzes the sensitivity of the value of U.S. multinationals to exchange rate movements. He points out that foreign exchange exposure can be decomposed into its effect on the value of net monetary assets with fixed nominal payoffs, and on the value of real assets held by the firm. Short-term foreign monetary assets are fully exposed to exchange risk, whereas domestic monetary assets are not. The value of real assets will be affected by exchange rate movements wherever their location. Therefore, even purely domestic firms may be affected through the effects of exchange rates on aggregate demand, or on the cost of traded inputs.

Adler and Dumas (1984) believe that exposure of assets is 100%. They state that the asset's exposure is equal to its foreign currency value on that date. However, the domestic-currency price of any asset or liability, physical or financial, whose future foreign currency value is uncertain, may also be sensitive to or correlated with exchange rate fluctuations and should, therefore, also be considered exposed. Inventory, whether imported or locally acquired, should be valued at the dollar equivalent of the post-devaluation local currency-selling price. This approach acknowledges that the economic value of an asset is equal to its future earnings stream. This is recognized by subsidiaries operating in devaluation prone countries. A typical strategy is to attempt to convert their excess cash balances into inventory that is expected to maintain its dollar value in the event of local currency devaluation.

Choi (1986) comments that changes in exchange rates affect the value of firms because of the sensitivity of cash flows to exchange rate changes. If markets are "inefficient" the value of the firm may also be affected by the translation effects of exposed cash flow positions (only economic exposure is relevant since, in an efficient market, the accounting effects will be fully discounted by rational investors). Choi (1984) lists three reasons why accounting exposure matters: a) taxes affect the real cash flows and hence firm values, b) hedging decisions of firm's management (which have real cash flow consequences) are often motivated by expected reported earnings, and c) information signaling of the earnings announcement may have an effect on firm's value. Still changes in exchange rates may also affect the firm's systematic risk and hence its market value.

Shapiro (1975) studies the relationship between changes in currency values and decisions about international investing, trading, production, and the marketing that firms make on a regular basis. His approach ensures that other financial items whose value will be adversely affected by a devaluation are considered, in addition to those on the current balance sheet. Fixed assets are considered to maintain their dollar value after a devaluation because their local currency value is expected to rise in proportion to the extent of any devaluation. However, he points out that since the dollar value of a firm is assumed to equal the discounted sum of future after-tax dollar flows, retrospective accounting techniques cannot account for a devaluation's effect on the value of a firm. In his work (1975), Shapiro mentions a study by the US Department of Commerce that analyzed the price behavior of US imports subsequent to the 1971 dollar devaluation. The study included one hundred major manufactured products imported from different countries. Of these products, 50% had risen in price by the degree of the devaluation, and 20% had dollar price increases equaling 1/2 to 3/4 of the devaluation. Foreign suppliers appeared to absorb most of the increased dollar costs associated with the devaluation for a third group of twenty commodities.

In a study of the same period, Branson (1972) observed the lack of response of US dollar import prices to the 1971-dollar devaluation. He explained the reaction of local currency prices of imported goods by the degree of local competition and the ability of exporters to absorb a reduction in their home currency profits. The argument offered is that local demand will also be influenced by the devaluation's effect on relative income since a devaluation may cause a decline in real income due to more costly imports and import competing goods. A devaluation can have an expansionary effect on the economy of the devaluing country but real income will increase only if there are readily employable resources available (in the case of less than full employment and balance of payment deficit).

A firm is assumed to use three partially substitutable inputs in its production function: non-traded domestic goods and services traded local goods and services, and imported goods and services. The total cost is for a given combination of the above inputs. The dollar prices of domestic traded and non-traded goods and services respond positively to inflation and negatively to a devaluation. Therefore, the firm's total dollar cost becomes a function of total output, the wholesale price level, and the exchange rate.

In our case, since we are just looking at a one to three day market reaction to an abnormal change in exchange rate (as defined in this paper), inflation is not considered. The reason is that the change is not likely to be significant, although expectations of inflation may also have changed. If we are interested in the relationship between devaluation and profitability, in general, an export-oriented firm is likely to experience a gain from a devaluation. Nevertheless, a purely domestic firm with little or no foreign competition is likely to experience losses from a devaluation unless real income rises. A firm facing stiff import competition under reasonable demand conditions can profit from a devaluation (and vice versa for the case of a revaluation).

Nevertheless, the real impact on the value of the firm can only be measured by examining the total effect of devaluation on future cash flows. The traditional view is that the firm will show a loss on its net local currency monetary assets and liabilities in addition to the change in its future profitability. From a cash flow standpoint, to the extent the exchange rate causes additional (fewer) net current assets to be required, a one-time loss (gain) is incurred. This loss (gain) is equal to the additional home currency funds foregone (obtained). Furthermore, unless the firm can revalue its fixed assets, the dollar value of local currency cash flows from depreciation will decline. This cash flow will maintain its dollar value only if the government permits the firm to revalue these fixed assets to preserve their historical dollar value.

In this paper two issues have to be taken into consideration: a) most exchange rates were fixed during 70s (when the majority of the previously mentioned studies were conducted), but this is not the case of Peru in 1994; and b) in our case, we are measuring a one day change in the price of the firm's stock in order to compare it to the change in each companies' revenue/expense structure and the exchange rate change. As already mentioned, in this study the inflation is not considered a factor since it did not significantly change from t_{-1} to t_0. The main difficulty is to determine revenues and costs after the devaluation since they will not follow the same pattern as before the event. In this respect, Dufey (1972)

mentions "an indiscriminate application of the devaluation percentage to the projected pre-devaluation flow gives an inaccurate picture."

Some of the variables Shapiro concluded were major factors affecting a multinational firm's exchange risk included: the distribution of its sales between domestic and export markets, the amount of import competition the firm faces domestically, and the degree of substitutability between local and imported factors of production. The direction and volume of trade is dependent on the distinction between increasing and decreasing cost technologies. Balance of payments effects are determined by this distinction, as well as classical import and export demand elasticity.

DATA

In this study, the period of examination is 1994. This year was selected because of the availability of financial statements, exchange rate, and stock price information. The data used in this paper are: daily exchange rates between the US dollar and the Peruvian Nuevo Sol, daily closing stock prices of the selected companies to be studied, yearly financial statements of the same group of firms, information regarding their cash flows in US dollars. Data sources: COMPUSTAT, DISCLOSURE, DATASTREAM, IMF, BVL (Lima Stock Exchange), and the corporations studied.

The Peruvian companies analyzed in this paper were chosen because: a) they were listed on the stock exchange, b) had the longest operation histories within their industry group, and c) offered the necessary data. Initially, we started with ten Peruvian companies, this number was reduced to the two listed below. The reduction in the sample size resulted from the lack of precise financial information needed for the study. The final list of companies is the following:

Mining: Compañía de Minas Buenaventura S.A.
Public Services: Telefónica del Perú S.A.

METHODOLOGY

The first step in the methodology applied in this paper is to locate three standard deviation one-day changes in the Peruvian Nuevo Sol/U.S. dollar exchange rate. This is done by determining all the exchange rate changes during the year 1994, $S_t - S_{t-1} / S_{t-1}$, finding the standard deviation, calculating a three standard deviation, and isolating the events that fulfill this premise (event days t_0).

The second step is to isolate the stock prices of the mentioned corporations for the same event dates (t_0) and calculate the return in the stock price from t_{-1} to t_0, $Sk_t - Sk_{t-1}/Sk_{t-1}$. In this step we also measure the change in the volume of stocks traded. This is done by averaging the number of shares traded per stock before the event for t-120 to t-30. The expected volume equals the average volume of operations per stock traded during the period t_{-120} to $t_{-30.}$

The actual volume traded on the event day is compared to the expected volume and the difference is used to determine the significance of the change in the number of shares traded.

The third step in this process is to determine the impact of the change in the exchange rate in both companies. For each company in the sample, the analysis encompasses a study of the theoretical economic impact, and a study of the change in the price/earnings ratio of the corporation resulting from the appreciation/devaluation of the Nuevo Sol in relation to the US dollar. These findings are compared to the actual change in price of each corporations' stock from t_0 to t_1. The stock returns for the period t_1 to t_{10} are also be examined to determine whether there are any lagged responses during that period in the evaluation of the stock prices.

EMPIRICAL RESULTS

As already mentioned, the number of companies studied was reduced from ten to two. The motive was the lack of precise information that would permit the study of the effect of exchange rates on the value per share of the corporation. Additionally, changes in the volume traded during the event day were not calculated. The reason is that excessive variability (changes as erratic as one day 1,000 shares and next day 50 shares traded) rendered the results meaningless.

In reference to the first step described in the Methodology section, it was determined that during 1994 there was one three standard deviation change in the exchange rate on December 28. This change brought the value of the Nuevo Sol from 2.089427 (December 27) to 2.195871 (December 28), which equaled a 4.8% devaluation. Below we examine how this one day 4.8% devaluation of the Nuevo Sol, affected the two corporations included in our sample.

COMPAÑÍA DE MINAS BUENAVENTURA

Buenaventura is Peru's largest publicity traded precious metals company. The company is engaged in the mining, processing, development and exploration of primarily gold and silver in Peru. The Company operates four mines, has controlling interests in two mining companies, and has minority interests in several other mining companies. At the end of 1994, gold, silver, and other metals accounted for approximately 66 percent, 29 percent and 5 percent respectively of the Company's equity share of production in its consolidated subsidiaries. Because the Company's revenues are derived primarily from the sale of ore concentrates containing gold and silver, the price the company's earnings are directly related to world market prices for these metals. Such prices have historically fluctuated widely and are affected by numerous factors including the overall demand for and worldwide supply of gold and silver, the availability and price of competing commodities, international economic trends, currency exchange fluctuations, expectations of inflation, actions of commodity market participants (including speculative activities), consumption and demand patterns, and political events in major producing countries.

The demand for gold is comprised of product fabrication and investment. Product fabrication includes jewelry (the largest source of demand for gold), electronics, dentistry and coins as well as other uses. Investment includes purchases of gold bullion and fabricated gold. Gold bullion is fungible and is traded in several markets throughout the world. Futures' trading is dominated by the New York Commodities Exchange (which merged with the NYSE in 1994), and the Tokyo Commodity Exchange in Tokyo.

The demand for silver is comprised of product fabrication and investment. Product fabrication consists of primarily industrial applications, photosensitive silver halides and sterling and plated silver. Investment includes purchase of silver bullion and hedging and speculation by investors and producers of silver. Silver is actively traded in several markets throughout the world. Silver futures and traded on the COMEX, the CBT, The MidAmerica Commodity Exchange, the Winnipeg Commodity Exchange, and the LBM.

Minas Buenaventura hedged approximately 30% of its total production of gold and silver in 1994 through forward sales of gold and silver metals. The intended effect of the hedging transactions was to lock a minimum sales price for future production at the time of transaction, thereby reducing the impact on the Company of a future fall in gold and silver prices. Other hedging techniques have been used in the past, but none have been applied to the exchange rate exposure. The company's revenues are almost totally denominated in U.S. dollars, and its operating expenses primarily denominated in Nuevos Soles. As mentioned before, in the past, the Peruvian currency has been devalued numerous times. Therefore, if inflation in Peru were to increase without a corresponding devaluation in the Nuevo Sol relative to the U.S. Dollar, the financial position and results of operations of the Company and the market price of the shares could be affected. In order to study the effect of this event in the revenue and expense structure of the company it is necessary to study the financial statements, starting with the balance sheet (see Appendix A for Buenaventura's Financial Statements).

Buenaventura's financial statements show that a portion of the company's monetary assets and liabilities are denominated US Dollars. Since the balance sheet reports the equivalent of the US Dollar denominated monetary assets and liabilities in Nuevos Soles valued as of December 31, 1994, to determine the change in value as a result of the devaluation, it is necessary to add or subtract from this value the change in value of the stock as of December 27 (the day before the devaluation took place). This will reflect the net gain or loss on the balance sheet. Examining the US Dollar/Peruvian Nuevo Sol closing prices, we determine that the net different in the value of the currency between December 28 (1US$=S. /2.196) and December 31 (1US$=S. /2.175), 1994 is almost equal to zero.

COMPAÑIA DE MINAS BUENAVENTURA
MONETARY ASSETS AND LIABILITIES
(In thousands)

	As of 12/31/94	As of 12/31/94	As of 12/27/94	
	US Dollars ($)	Peruvian Soles (S./)	Peruvian Soles (S. /)	
Assets:				
Cash and Cash Equivalents	$194	S. /421.95	S. /405.27	
Accounts Receivable	8,875	19,303.13	18,539.88	
Total	9,069	19,725	18,945.14	
Liabilities:				
Bank Loans and Overdrafts	25,580	55,636.50	53,436.62	
Trade Accounts Payable	253	550.28	528.52	
Other current Liabilities	2,162	4,702.35	4516.42	
Current Portion of Long-term Debt	6,859	14,918.33	14,328.45	
Long-term Debt	18,940	41,194.50	39,565.66	
Total				
Net Liabilities	($44,725)	(S./97,276.88)	(S./93,430.53)	
Net change in Soles				(3,846.35)
Exchange rates:				
12/27/94 1US$=S./2.089				
12/28/94 1US$=S./2.196				
12/31/94 1US$=s./2.175				

As we can see from the above table, the negative change in value in the Balance Sheet between December 27 and December 31, 1994 is 3,846,350 Nuevos Soles. This is a one-time change in the total value because this is a position figure.

In the Income Statement we calculate that a devaluation of 4.8% (from Dec. 27 to Dec. 28) is equivalent (other things equal) to an increase in revenue of 5.1%. This is because: .048/(1-.048)= 5.1%. We assume that this change in the value of the Nuevo Sol does not affect demand since the cost of the product in US$ has not changed and we assume that the other major currencies did not devalue against the dollar at the same time in the same magnitude. To make the calculations of the impact of this devaluation in the income statement, we use 1994 for the projections since any other increase in revenues will be the result of normal expectations. Normal growth is already included in the market price of the stock. Therefore, the calculated increase (or change) is in addition to the normal growth between 1994 and 1995 (see Appendix A for Buenaventura Financial Statements).

As already mentioned, all revenues in the Income Statement are produced in US Dollars and most expenses in Peruvian Nuevos Soles. The exception is the interest expense for monetary items in US Dollars. Therefore, all expenses remain constant except for the interest portion of the operating expenses and taxes. In finding the change in value, the first step is to calculate the value of the sales in US Dollars as of December 31, 1994 (all numbers below are in thousands).

Since the following numbers are in US and we need to determine the change in value between December 27 and December 31st, we first calculate the equivalent in US$ as of December31[st] of total sales. Then, we use this figure in Dollars to calculate the equivalent in value as of December 27 and 28 to find the change. We are utilizing December 31st. because there is effectively no change between this date's exchange rate and that of December 28.

CALCULATIONS:

Total sales as of December 31,1994: S./176,014

In order to find the value of this total sale figure in US$ as of December 31st, 1994, we divide by the exchange rate at that date:
S./176,014 : 2.175 = $80,925.98

We use this figure in US$ and multiply it by the rates at December 27 and 28 to determine the change in value between these dates: .

December 27, 1994,   1US$=S./ 2.089, therefore:
$80,925.98*2.089 = S./169,054

We also take the 1994 sales as of December 27, and multiply by the change caused by the devaluation:
S./169,054 * 5.1% = S./8,621.75 increase in revenue

From this increase in revenue we have to deduct the increase in interest paid
Interest paid as of December 31st: S./15,620

We divide by the rate as of December 31st. to calculate the equivalent in US$:
 S./15,620 / 2.175 = $7,181

And we multiply the result to find the equivalent in Soles as of December 27th
$7,181*2.089 = S./15,002.38

S./15,002.28- S./15.770.81 = S./768.43 is the increase in interest expense

     S./8,621.75 (increase in revenue)
 - <u>S./ 768.43</u> (increase in interest expense)   ∵
  = S./7,853.32 increase in revenue

From this increase we have to deduct the increase in tax (13.8%) expense:

Change in Revenue:	S./7,853.322
Change in Tax	<u>- S./1,083.760</u>
Net increase in income	S./6,769.560

To calculate the total value change in the company resulting from the devaluation, we are taking the change in net income and multiply by the price to earnings ratio, which equals the total change in value of the corporation resulting from the increase in net income.

Price per share as of December 27, 1994 = S./6.78
Earnings per shares S. 17

(Price/Earnings) * (earnings per share) = price
Price / Earnings = S./6.78/. 17 =39.88

We multiply the Price/Earnings by the net increase in income to find the total increase in value. From this number we subtract the change in the balance sheet value and determine the total change in value.

S./6,769.56 * S./39.88=	S./269,970.05
- Change in balance sheet value	(S./3,846.35)
Total change (increase) in value	S./266,123.7028 * 1,000= S./266,123,702.8

To find out the change on a per share basis, we divide the change by the number of shares outstanding:
S./266,123.70 / 90,196,500 = S./2.95.

This is the estimated corresponding increase in price per share between December 27 and December 28, 1994.

Adding the calculated S./2.95 increase to the stock price as of December 27, yields the expected price of S./9.73 after the devaluation on December 28,1994.

As we can deduct from the above calculations, the revenue and expense structure of this company is affected by changes in the exchange rate. Even though the effect is economically significant, in accordance with findings mentioned in the literature review, the market does not value immediately the effect of this change. To determine whether there was a delayed reaction, we studied Buenaventura's stock exchange closing prices for the ten days following the event day. Contrary to expectations, after the initial increase of S./ .18 per share to a value of S./6.96, prices went down to their pre-event value. Nevertheless, as of 5/30/95, the price per share is S./9.09, close to the prediction of S./9.73.

TELEFÓNICA DEL PERÚ S.A.

Telefónica del Perú S.A. is a full service telecommunications provider. It offers fixed local, domestic, and international long distance telephone services, on an exclusive basis, through Peru, as well as a wide range of other telecommunications services, including cellular telephone and paging services, business communications and related services and cable television. Telefónica is also the primary operator of Peru's public telephone system. As of March 31, 1996 the company had approximately 1.2 million lines in service and digitalization rates of 79.0% and 100% for local switching equipment and trunk connections, respectively. On the basis of revenues and net income of S/2.5 billion (approx. $1.0 billion) and S/726.3 million ($308.7 million), respectively, in 1995, Telefónica del Peru is the largest company in Peru and it has the exclusive right to provide the mentioned services in Peru until

June 27, 1999.

Demand for telephone services in Peru has been unsatisfied due to lack of investment, high prices, poor service, and long waiting periods. Peru has, at the time of the study, a low penetration rate with 5.0 lines in service per 100 inhabitants and 3.0 cellular subscribers per 1000 inhabitants at March 31, 1996. Continued growth in demand for telecommunications services in Peru will be influenced by the growth of the Peruvian economy.

Peru has experienced relatively high growth rates in recent years with GDP increasing by 6.5%, 12.9% and 6.9% in 1993, 1994, and 1995. In the long run, it is expected that demand and supply for telecommunication services in Peru will be similar to that of other developing nations.

An examination of Telefónica's financial statements and other company information shows that during the periods of 1994 and 1995 the company did not use currency hedges to protect itself from exchange rate exposure. In order to determine the impact that the Nuevo Sol devaluation on 12/28/94 had in the Compañía Telefónica del Peru, *once* more we examine the Balance Sheet and the Income Statement (see appendix B for Telefónica's Financial Statements).

In the Itemized Balance Sheet we find that some of the monetary assets and liabilities are in US Dollars. Since the Balance Sheet is expressed in Nuevos Soles and the exchange rate used to calculate these Nuevos Soles is the official exchange rate on December 31, 1994, the first step is to calculate the value of these monetary assets and liabilities as of December 31, and then subtract the value of these items as of December 27, the day prior to the devaluation which occurred on December 28. This will reflect the net change. By observation, we determine that the net difference of the value of the currency between December 28 and December 31 is almost equal to zero.

TELEFÓNICA DEL PERU
MONETARY ASSETS AND LIABILITIES
(In thousands)

	As of 12/31/94	As of 12/27/94	
	Peruvian Soles	**Peruvian Soles**	**Peruvian Soles**
Assets:			
Cash and Cash Equivalents	854,079	820,309	
Accounts receivable	71,101	68,290	
SDRs	65,669	63,072	
Investments	45,735	43,927	
Total	S./l,036,584	S./995.597	
Liabilities:			
Trade Accounts payable	44,931	43,154	
Long-term Debt	70	68,097	
Total	S./115,831	S./111.251	
Net Assets	920,753	884,346	
Net change			(S./36,407)
Exchange rates:			
12/27/94 1US$=2.089			
12/28/94 1US$=2.196			
12/31/94 IUS$=2.175			

As we can see from the above table, the negative change in value in the Balance Sheet between December 28 and December 31, 1994 is of 36,407,000 Nuevos Soles. This is a one-time change in the total value because this is a position figure.

In the Income Statement there are revenues and expenses both in Nuevos Soles and US Dollars. The revenues in US Dollars are: 70% of International Long Distance (ILD) calls, and 70% of other. The expenses in US Dollars are: 100% of technology transfer and management fees, and 80% of materials and supplies (see appendix B for Telefónica Financial Statements).

In reference to international long distance calls (ILD), these operating revenues consist of revenues from incoming traffic and revenues from outgoing traffic (net payments to foreign carries for outgoing calls). The amount of operating revenues from ILD services depends on the volume of traffic, the rates charged by the Company to its customers, and the settlement rates agreed with various foreign carriers. Due to the imbalance between the Company's outgoing and incoming international calls, any changes in exchange rates should have a significant effect in the company's revenues since incoming traffic is significantly greater than outgoing traffic.

The technology transfer fee represents 1.0% of the Company's operating revenues (paid in US$), the management fee is 9.0% of the Company's operating profit before depreciation, payment of the technology transfer and management fees and duties, contributions and royalties. Therefore, in order to determine the impact of the devaluation in the Income Statement, we need to calculate the revenues and expenses in US Dollars.

CALCULATIONS:

Revenues:
ILD Revenues in US$: S./513,344*70% = S./359,340.80
Other Revenues in US$ S./126,015*70%= S./88,210.50
Total Revenues (12/31) S./447,551.30

Value of total revenues affected as of 12/27 (prior to the devaluation of 12/28):
S./447,551.30 * (2.089/2,175) =S./429,855

Increase in revenues caused by the devaluation:
S./447,551.30- 429,855 = S./17,696.3

Operating expenses changes in Soles caused by the devaluation:
Technology transfer in US$ S./50,600*100%= S./50,600
Materials and supplies in US$.   S./78923^{lt}80%= S./63,138.40
Total expenses (12/31)   S./113,738.40

Operating expenses in soles as of 12/27, prior to devaluation:
S./113,738.4 * (2.089/2.175) =S./109,241.16

Net increase in operating expenses, caused by the devaluation:
133,738.4 - 109,241.16= S./4,497.24

The balance sheet items that represent US$- liabilities in soles are:

Current portion of long term debt   S/62,496
Long term debt   S./57,739
Total Debt   S./120,235

Of the total debt calculated above, S./70,900 is Dollar denominated.

To find the interest effect of the devaluation, we calculate the percentage of US$ long term:
S./70,900/120,235 = .589 percentage affected by devaluation

Interest expense paid in 1994   S./48.312
Interest expense affected by devaluation   S./48,312*.589 - S./28,488.55

Interest expense in soles prior to devaluation:
S./28,488.55* (2.089/2.175) = S./27.362.10

Net increase in interest expense caused by the devaluation:
S./28,488.55 - 27,362.10= S./l,126.45

Total increase in expenses caused by the devaluation:

Net increase in operating expenses: S./4,497.24
Net increase in interest expense: <u>S./1,126.45</u>
Total   S/5,623.69

Net increase in revenues: S./7,696.30
Net increase in operating expenses: <u>S./5.623.69</u>
Change in pretax income: S./2,072.61

Change in pretax income   S./2,072.61
Minus taxes @ 40%   <u>S./ 829.04</u>
Change in net income . t   S./l,243.56

Net increase in income purely from the change in the exchange rate:
S./l,243.56

To determine the total value added to the company by the devaluation:
Price per share: S./2.55
Earnings per share: S./.04
Year end price/earnings: 2.55/.04 = 63.75

S./l,243.56* 2.55/.04 = S,/79,276.95 total value added to the company by the devaluation

From this amount we have to subtract the change in the balance sheet
S./79,276.95 - 36,407.00 = S./42,869.95

Since all amounts are in thousands, we need to multiply to get the total change:
S./42,869.95 * 1000 = S./42,869,950.00

To find the hypothesized change in value of the shares after the devaluation, we put it in a per share basis:
Total change   S./42,869,950.00
Total number of shares   S./220,050,000
Increase in price per share resulting from this devaluation: S./ .1948

The revenue and expense structure of this company is affected by changes in the exchange rate. Even though the effect is economically significant, once more, the market does not value immediately the impact of this change. To determine whether there was a delayed reaction, we studied Telefónica's stock exchange closing prices for the ten days following the event. Contrary to expectations, there was an initial decrease of S./.05 per share, and thereafter fluctuations around +/- S.10.

CONCLUSION

This study has examined how individual stock prices of a group of selected companies were affected by a three standard deviation change in the exchange rate between the Peruvian Nuevo Sol and the US Dollar. The main objective was to determine whether this change affected the revenue and expense structure of these companies and whether the stock market immediately reacted to the new information. Due to lack of available detailed information, the sample size was reduced to two companies and, therefore, we cannot assume the findings in this study can be generalized o lost stocks. Nevertheless, these two companies are the largest ones within their industry groups.

In each of the cases examined, the stock market ignored the effect that the change in the exchange rate had in the value of the corporation. A possible reason of why the market would ignore this information is that currency prices change on a daily basis and in many instances a devaluation is proceeded by a revaluation, even if it is not immediate. Perhaps the lack of response has to do with difficulty in measuring the fall impact of the change as well as the impossibility of determining whether this change is going to be permanent. These results are in agreement with the findings of other researchers mentioned in the literature review.

In the financial statement analysis of these companies, the most interesting finding is that changes in the exchange rate between the Peruvian Nuevo Sol and the US Dollar affect most corporations, not only those with import or export operations. The reason for this, is that many companies keep liquid assets in Dollars, or they have loans in Dollars. This fact highlights the importance of currency management as an integral part of financial management.

APPENDIX A

COMPAÑÍA DE MINAS BUENAVENTURA S.A.

Balance Sheet
As of December 31
(in thousands of Peruvian Soles)

	1994		**1994**
ASSETS		LIABILITIES & OWNERS' EQUITY	
Current Assets:		Current Liabilities:	
Cash & Cash Equivalents	S./2,120	Accounts Payable	S./l1,153
Accounts Receivable – Trade	21,683	Current Portion of Long Term Debt	16,371
Inventories		Income Tax Payable	3,101
Concentrates (ores)	21,472	Bank Loans and Overdrafts	60,967
Supplies	24,164	Current Portion - severance indemnities	8,175
Prepaid Expenses (total)	5,141	Other Current Liabilities	10,775
Total Current Assets	**S./74,580**	**Total Current Liabilities**	**S./110,542**
Fixed Assets:		Long Term Debt:	
Buildings and other premises	S./109,060	Long Term Debt	S./45,427
Machinery and Equipment	15,052	Personnel Severance Indemnities	2,613
Transportation units	1,933	**Total Long Term Debt**	**S./48,040**
Furniture and Fixtures	936		
Construction in Progress	2,376	**Total Liabilities**	**S/158,582**
Land	3,182		
Total Gross Fixed Assets	S./132,539	Owners' Equity:	

Less: Accumulated Depreciation	0	Common stock	S./137,300
Total Net Fixed Assets	**S./132,539**	Additional Paid in Capital	11,520
		Labor Shares	22,276
Intangibles:		Minority Interest	14,665
Exploration Costs	S./32,218	Legal Reserve	434
Concessions and mining rights	4,069	Accumulated profits (losses)	(29,700)
Environment and feasibility studies	336	**Total Owners' Equity**	**S./156,495**
Less: Accumulated Amortization	(11,916)		
Total Intangibles	**S./24,707**	**_Total Liabilities & Owners' Equity_**	**_S./315,077_**

Other Non-Current Assets:	
Investments in affiliates	S./49,784
Escrow Account	0
Other assets	33,467
Total Other Non-Current Assets	**S./83,251**
Total Assets	**_S/315,077_**

COMPAÑIA DE MINAS BUENAVERTURA S.A.

Income Statement
Year Ended December 31
(in thousands of Soles)

	1994
Sales:	
	S./176,014
Total Sales	S./176,014
Gross Profit	S./176,014
Total Operating Expenses	S./176,628
Operating Income (loss)	(S./614)
Other Income & (Expense):	
Gain from Exposure to inflation	8,614
Ownership interest in affiliates	22,850
Other, net	9,030
Total Other Income & Expense	S./40,494
Earnings before Interest & Tax	S./39,880
Interest Expense	15,620
Ownership interest in affiliates	2,824
Earnings before Taxes	S./24,260
Federal and State Income Taxes	3,341
Net Income (Loss)	**S./20,919**

APENDIX B

TELEFÓNICA DEL PERÚ S.A.

Balance Sheet
As of December 31
(in thousands of Soles)

	1994
ASSETS	
Current Assets:	
Cash & Cash Equivalents	S./965,592
Accounts Receivable - Trade	325,093
Other Accounts Receivable	103,576
Inventories	125,349
Deferred Costs & Other Current Assets	12,104
Total Current Assets	**S./l,531,714**
Fixed Assets:	
Property, Plant & Equipment	S./4,332,963
Total Gross Fixed Assets	S./4,332,963
Less: Accumulated Depreciation	(2,262,198)
Total Net Fixed Assets	**S./2,070,765**
Other Non-Current Assets:	
Investments	S./45,920
Other Assets	6,098
Total Other Non-Current Assets	**S./52,018**
Total Assets	***S./3,654,497***
LIABILITIES & OWNERS'EQUITY	
Accounts Payable	S./105,721
Current Portion of Long Term Debt	62,496
Employees' Severance Provision	6,880
Other Current Liabilities	357,014
Total Current Liabilities	**S./532,111**
Long Term Debt:	
Long Term Debt	S./57,739
Guaranty Deposits	103,882
Total Long Term Debt	**S./161,621**

Total Liabilities	**S./693,732**
Owners´ Equity:	
Common stock	S./2,679,100
Additional Paid in Capital	87,079
Legal Reserve	108,566
Retained Earnings	86,020
Total Owner's Equity	**S./2,960,765**
Total Liabilities & Owner's Equity	***S./3,654,497***

TELEFÓNICA DEL PERÚ S. A.
Income Statement
Year Ended December 31
(in thousands of Soles)

	1994
Sales:	
Local Telephone Services	S./597,010
International Long Distance	513,344
Domestic Long Distance	292,582
Public Telephone Services	85,236
Mobile Services	67,613
Other	126,015
Total Sales	S./1,681,800
Total Operating Expenses	S./1,258,371
Operating Income (loss)	S./423,429
Other Income & (Expense):	
Interest Income	S./57,709
Early Retirement Program	(177,892)
Inflation Gain (Loss)	(92,521)
Other, net	7,364
Total Other Income & Expense	S./205,340)
Earnings before Interest & Tax	S./218,089
Interest Expense	48,312
Workers´ Participation	16,703
Earnings before Taxes	S./153,074
Federal and State Income Taxes	68,620
Net Income (Loss)	***S./84,454***

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