Is there a January effect in the Swedish Krona?

An evaluation based on some economic determinants

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**ABSTRACT**

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<td>Problem:</td>
<td>The level of an exchange rate is influenced by a number of economic factors and government policies. These economic factors influence the exchange rate in varying degrees. Additionally, governmental policies such as government expenditures are enacted at certain periods of the year. The rate of adjustment to changes in these policies as well as access to market information differs among agents. Such differences have led to anomalies in some foreign exchange markets. To this end, we seek to analyze the existence of such a phenomenon in the Swedish Krona.</td>
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<td>Aim of Study:</td>
<td>This paper investigates the existence of anomalies in the Swedish Krona based on some economic determinants. The cross rates under consideration are: SEK/€ and SEK/$. The research questions for this paper are:</td>
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<td>🌟 What factors account for fluctuations in the Swedish Krona?</td>
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<td>🌟 Is there evidence of the January effect in the Swedish Krona?</td>
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<td>Multiple Regression analysis, Correlation coefficient.</td>
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<td>Results:</td>
<td>There is a noticeable trend of positive returns in January for the SEK/€ but not for the SEK/$. However, the regression results with respect to <em>p</em>-values and <em>t</em>-statistics were statistically insignificant and therefore do not support the January effect.</td>
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<td>Keywords:</td>
<td>Swedish Krona (SEK), Real and Nominal exchange rates, Anomalies.</td>
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Acknowledgements

We render immense thanks to our supervisor Clas Eriksson for his contribution in the realization of this paper. Thanks to the lecturers at the department of Economics at Mälardalen University. Their lectures have contributed to our knowledge on the subject of Economics.
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I Introduction

1.1 Background

An exchange rate defines the terms of trade between two nations. Here, we make a distinction between nominal and real exchange rates. The nominal exchange rate is the relative price of two currencies. It is expressed as the number of units of home currency required to buy a unit of foreign currency. If we consider Sweden (kronor) as the home country and the United States (dollar) as the foreign country, then the nominal or currency exchange rate \( E \) would be:

\[
E = \frac{\text{local currency}}{\text{foreign currency}} = \frac{\text{krona}}{\text{dollar}}
\]

The real exchange rate on the other hand measures the rate at which two countries’ goods trade against each other. It makes use of the price levels in the two countries. Let \( P_{SE} \) be the overall price level in Sweden (home country); and \( P_{US} \) be the overall price level in the United States (foreign country), then the real exchange rate \( \text{re} \) is:

\[
\text{re} = E \times \frac{P_{US}}{P_{SE}}
\]

Knowledge of exchange rates is crucial in international finance. It should be noted that the very essence of international investment depends on exchange rates. Investors need to know the worth of their investments when converted back to their home currency at a future date. Also, there is a need for international companies to secure a fixed exchange rate via a forward contract to reduce uncertainty about costs and revenues.

1.2 Problem Formulation

The importance of foreign exchange rates has led to enormous amount of research. Influenced by the presence of anomalies in the US stock market (Elton, 2007) and the Turkish foreign exchange market (Aydoğan and Booth, 2003), and given that some of our friends have been able to realize profits from trading the Swedish Krona (SEK) within certain periods, we set out in this paper to investigate possible anomalies within some cross rates with the SEK.
Moreover, an exchange rate is influenced by a number of economic variables and government policies. Each of these economic indicators has a unique level of influence on the exchange rate. In addition, governmental policies such as government expenditures are enacted at certain periods of the year, which may influence the exchange rate at that time period. The rate of adjustment to changes in these policies as well as to market information differs among agents (e.g. central banks and private investors) and between points in time. Such differences have led to anomalies in some foreign exchange markets (Aydoğan and Booth, 2003). Therefore, we seek to analyze the existence of such a phenomenon in the Swedish Krona (SEK).

1.3 Aim of Study

The goal of this study is to search for the January anomaly based on some economic theories and determining factors. By anomaly, we refer to any strange, unusual, or unique occurrence which deviates from established trends or economic principles. These economic theories attempt to explain the equilibrium and disequilibrium in the foreign exchange market. We aim at gauging when the SEK is likely to be misaligned and if an identified anomaly is evidence of a stable and long running phenomenon which an investment strategy could be based on, or whether it is just a short-term unique mispricing which will disappear in the long term. The research questions for this paper include:

- What factors account for fluctuations in the Swedish Krona?
- Is there evidence of a January effect in the Swedish Krona?

These questions will be evaluated based on the results of our computations on MS excel. Multiple regression analysis will be used to determine the level of significance for the monthly dummy variables. The exchange rates used in this paper include the SEK/€ and the SEK/$.

1.4 Previous Research

Enormous amounts of research have been done on anomalies in both the foreign exchange and security markets. These studies showed different results for fluctuations in the real exchange rates. Some authors hold that supply shocks are negligible, whereas real demand and monetary
shocks accounted for the major instability of the SEK (Thomas, 1995). On the contrary, Alexius (2001) argues that the supply shocks accounted for more than 60 percent in the long-run during the period 1960:1-1998:4. Furthermore, Aydogan and Booth (2003) found evidence of “holiday”, “day-of-the-week” and “week-of-month” effects in the Turkish foreign exchange market for the period 1986-1994. They noticed that the exchange rate for Mondays and the first week of the month were better than the rest of the week and month respectively. The results of these papers shall constitute guidelines for this study.

### 1.5 Outline of Thesis

This paper is divided into four sections. The first gives a general introduction. Here, we take a look at the background, the problem formulation, the aim of study and give a brief review of previous studies. The second section considers the factors that determine the exchange rate. Examples of these factors include: inflation, interest rates, GDP, productivity effect and balance of payment. It begins with an analysis of the foreign exchange market and goes on to underscore some economic theories of exchange rates. In section three, we present a literature review of some calendar anomalies with emphasis on the January effect in the stock market. This will inspire our search for the January effect in the foreign exchange market. Section four presents the methodology and results of our empirical study. It considers the regression equation used, a procedure for data selection, as well as a multiple regression analysis with conclusions based on the t-statistics. Finally, the paper concludes with a summary of our study and a suggestion on further directions of research.
II Determinants of Exchange rates

The exchange rate of a currency often fluctuates over a period of time. It assumes a stochastic process similar to that of the stock market. There are various factors that determine such movements. These factors can either be classified as structural (e.g. political administration), microeconomic (e.g. order flow) or macroeconomic (e.g. inflation). The influence on the exchange rates by these factors can either be short-term or long-term. However, there is no consensus in the literature on the factors affecting exchange rates and their volatility. This absence of agreement reflects basic difficulties in modeling and predicting exchange rates (Canales-Kriljenko and Habermeier, 2004).

In this section, we present some of the fundamental factors that influence changes in the exchange rate. The exchange rate is a derivative of international trade. Thus it is of prime importance to analyze the relationship between exchange rate and the foreign exchange market.

2.1 Foreign Exchange market

The foreign exchange market comprises of two parts: balance of trade and balance of investments. It represents the relationship between countries influenced by international trade in goods/services and financial assets respectively. This relationship is by definition identical. That is, a rise in the demand for the foreign currency represents an increase in the demand for foreign goods and services and vice versa. Similarly, a higher foreign rate of return will cause an outflow of the domestic currency, since people will invest in foreign assets to make a profit. On the contrary, an increase in the domestic rates of return will initiate investments from abroad, thereby causing an inflow of domestic currency (McGregor, 1998). This will increase the demand for domestic currency which will in turn appreciate.

The accounting relationship that captures the trade in the foreign exchange market is given by the Balance of Payment (BoP).
2. 1.1 Balance of Payment (BoP)

The Balance of Payment is used as an indicator of economic and political stability. A country with consistently positive BoP implies that there is significant foreign investment within the country. This could also mean that the country does not export much of its currency. The International Monetary Fund (IMF) uses the following equation to reflect the BoP:

\[
BoP = current\ account - capital\ account - financial\ account \pm balancing\ items
\] (1)

This equation is in line with the above distinction. In broad terms, the Balance of Trade (BoT) is a subset of the current account, while the financial account reflects the Balance of Investments (BoI) (Spaulding, 2011).

The capital account consists of capital transfers and the acquisition and disposal of real and intangible assets, such as real estate or patents. The capital account balance represents capital transfers, and the sale of natural and intangible assets to foreigners (capital inflows) minus the capital transfers, and the purchase of foreign natural and intangible assets by Sweden (capital outflows).

\[
Capital\ Account\ Balance = Capital\ Inflows - Capital\ Outflows
\] (2)

Most transactions within the current account have offsetting entries in the financial account. That is, transactions in the current account and the financial account reflect the two sides of a balance sheet. The balancing item is simply an amount that reflects statistical errors. It assures that the current and capital accounts sum to zero (Spaulding, 2011).

The current account balance reflects changes in investment earnings, goods and services. It refers to the change in the value of Sweden’s net foreign asset. It represents the difference between the national savings and the domestic investments (Obstfeld and Rogoff, 1996). To illustrate this, let \( B_{t+1} \) be the value of Sweden’s net foreign asset at the end of the period \( t \). The current account balance over period \( t \) is given by

\[
CA_t = B_{t+1} - B_t
\] (3)

If there is no capital accumulation or government spending, then the current account becomes:
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\[ B_{t+1} - B_t = Y_t + r_t B_t - C_t \]  \hspace{1cm} (4)

where

\[ C_t = \text{private consumption} \]

\[ r_t B_t = \text{interest earned on foreign assets acquired previously} \]

\[ Y_t = \text{output produced within Sweden’s geographical boarders (GDP).} \]

The sum \( Y_t + r_t B_t \) is called the gross national product (GNP). It reflects the national income of an economy. That is,

\[ \text{GNP} = Y_t + r_t B_t \]  \hspace{1cm} (5)

Equation (4) implies that Sweden increases its net foreign assets if consumption is lower than GNP. Suppose \( K_{t+1} \) denotes the stock of domestic capital, then the total domestic private wealth at the end of the period \( t \) is given by

\[ B_{t+1} + K_{t+1} \]

Where \( K_{t+1} = K_t + I_t \) and

\[ K_t = \text{pre-existing capital} \]

\[ I_t = \text{new investment in time } t \]

Hence a change in domestic capital is given by:

\[ B_{t+1} + K_{t+1} - (B_t + K_t) = Y_t + r_t B_t - C_t - G_t \]  \hspace{1cm} (6)

Here, \( G_t \) is public expenditure. Substituting \( K_{t+1} = K_t + I_t \) into equation (6) gives:

\[ B_{t+1} - B_t = Y_t + r_t B_t - C_t - G_t - I_t \]  \hspace{1cm} (7)

Rearranging equation (7) implies:

\[ CA_t + I_t = Y_t + r_t B_t - C_t - G_t \]  \hspace{1cm} (8)

If we define national as \( S_t = Y_t + r_t B_t - C_t - G_t \), then equation (8) becomes:
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\[ S_t = CA_t + I_t \]

\[ \Rightarrow S_t - I_t = CA_t \]

Equation (9) implies that if \( S_t \geq I_t \), then \( CA_t \geq 0 \). A positive current account resulting from, for example, large net export, implies that the country sells more than it buys from abroad and hence it must be acquiring foreign assets of equal value. Likewise, a negative current account is an indicator that the country is borrowing foreign assets because its purchase from foreign nations is greater than its sales abroad. Since payment is received from abroad for Sweden’s exports, every positive item in its net exports is cancelled out by an equal negative item in its capital account. This makes the sum of the capital account surplus and the net export surplus equal to zero.

Figure 1 presents the trend in the Swedish BoT since the early 1990s. It shows that exports have exceeded imports for the given period. This result is largely due to the relatively weak development in the SEK, which stimulated exports and subdued imports.

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Figure 1 presents the trend in the Swedish BoT since the early 1990s. It shows that exports have exceeded imports for the given period. This result is largely due to the relatively weak development in the SEK, which stimulated exports and subdued imports.
Figure 2 relates the trend in BoT to fluctuation in the nominal exchange rate. Given the trade surplus, there is a decreasing trend in the nominal exchange rate which leads to an overall appreciation in the value of the SEK as depicted in the graph above. This helps to explain the downward trend that is visible in Figure 1.

Because the net balance on the current account constitutes an integral part of the measure of an economy’s saving, the net balance can be viewed as a meaningful indicator of an economy’s saving and spending behavior and consequently its credit worthiness.

2. 1.2 Credit worthiness
The credit worthiness of a nation reflects its ability to pay its debts. This can be measured from the nation’s BoP account. A BoP crisis or currency crisis occurs when a nation shows signs of being unable to repay its debts. The BoP crisis also occurs when a country is bankrupt. An acute example of this is the current situation in Greece. Typically, the result of such credit default is a rapid decline in the value of the nation's currency. Currency crises are often preceded by large capital inflows resulting from initial rapid economic growth. However, foreign investors may at some point become concerned about the level of debt that their inbound capital is generating, and may decide to pull out their funds. This outbound of capital flows would result in a rapid devaluation of the nation’s currency.

One option for the central bank is to increase its interest rates in order to prevent further decline in the value of its currency. However, while this can help those with debts denominated in foreign currencies, it generally further depresses the local economy.

2. 1.3 Foreign exchange dealers

The reaction of foreign exchange dealers is yet another factor that influences the exchange rate. The short-run exchange rate movements are attributed to market microstructure factors such as information aggregation by foreign exchange dealers. The microstructure approach suggests that non-dealers learn about macroeconomic fundamentals that affect the exchange rate. This knowledge is reflected in the orders they place with dealers. Dealers in turn learn about fundamentals from the order flow. The outcome of this two-stage learning process results in the formation of a price (Lyons, 2001).
2.2 Equilibrium Exchange Rate Theories

The foregoing section on the foreign exchange market presents some fundamentals of the exchange rate and its role on the economy. In this section, we take a look at some of the economic theories that account for exchange rate behavior. It seeks to predict the movements in nominal exchange rate based on some conditions. One such condition is the resulting effect on the nominal exchange rate by the interest rate.

2.2.1 Interest Rate Parity (IRP)

This analysis uses the Treasury bill to approximate the risk free interest rate. As stated above, the nominal or currency exchange rate \( E \) is:

\[
E = \frac{\text{local currency}}{\text{foreign currency}} = \frac{\text{krona}}{\text{dollar}}
\]

The relationship between exchange rates and interest rates is based on the interest rate parity (IRP). The IRP condition states that:

\[
(i - i^W) = \frac{F-E}{E}
\]

where

\( i \) = domestic interest rate

\( i^W \) = foreign interest rate

\( E \) = nominal exchange rate

\( F \) = forward rate \{ future rate of interest \}

\[
\frac{F-E}{E} = \delta = \text{expected depreciation in the nominal exchange rate}
\]

The parity equation (10) holds that there is a need for a compensating interest differential if there is a risk of a change in the exchange rate. It posits that there is a parallel shift in \( i^W \) and \( \delta \).
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The small open economy assumption, and implies that and expected depreciation of the domestic currency requires a positive interest differential. (Gärtner, 2006).

Foreign investors are keen on higher yielding savings account. An increase in the interest rates induced by the Riksbank (Central Bank of Sweden) would attract investments from both domestic and foreign investors. The former will invest because of an increased opportunity cost of holding money and the latter for profitable motives. This has the ripple effect of reducing money demand and hence affecting the rate of inflation in the short run. However, in the long-run the IRP dictates that currency valuations and interest rates should move in opposite directions. In the following subsection, we pay close attention to the effect of the intervention of the Riksbank on its currency.

2.2.2 Riksbank intervention on exchange rate

Money supply is a policy instrument used by the Riksbank to influence the value of its currency. A typical central bank holds four types of assets. These include: foreign currencies $M_{F}^{cb}$, foreign-currency-dominated bonds $B_{F}^{cb}$, gold and home-currency-denominated bonds $B_{H}^{cb}$. These government bonds net out in the consolidated balance sheet. The liabilities of the central bank include the monetary base which is a combination of the home currency ($M_{H}$) plus required reserves($RR$). It also includes net worth ($NW$), which is an accounting item that equates the balance sheet equation (Obstfeld and Rogoff, 1996, p.598). The balance sheet identity can be expressed in nominal home-currency terms as:

$$P^{g}Gold^{cb} + \varepsilon B_{H}^{cb} + B_{H}^{cb} + \varepsilon M_{F}^{cb} = M_{H} + RR + NW$$ (11)

where $P^{g}$ is the nominal price of gold. The central bank reduces the money supply in the economy by selling one of its assets to the public; and buys assets from the public when it intends to increase the money supply (Obstfeld and Rogoff, 1996, p.598).

There are two ways in which the central bank affects the value of its currency: the nonsterilized and the sterilized foreign-exchange market intervention. With the former, the central bank alters the money base via the sales and purchase of foreign money or bonds. The latter is a two-step procedure. Firstly, the central bank conducts a nonsterilized intervention by...
way of buying foreign-currency bonds with home currency that it issues. Then, it “sterilizes” the effect on the monetary base by selling a corresponding quantity of home-currency-dominated bonds to soak up the initial home currency increase (Obstfeld and Rogoff, 1996, p.598).

The graph below shows how a changes in the supply ($M^s$), at a given demand ($M^d$) for money, influences the interest rate. The $M^s$ curve is vertical because the Riksbank can choose any money supply it wants independently of the interest rate and consumers’ income. The $M^d$ curve is downward sloping indicating that the higher the interest rates, the lower is the quantity of money demanded. This is because of increased opportunity cost of holding money at higher interest rates (Husted and Melvin, 2007).

![Figure 3: Movements in Demand and Supply of Money to changes in interest rate](image)

An increase in money supply will shift the $M^s$ curve from $M^s_0$ to $M^s_1$ as shown in Figure 3. However, the money demand curve is unaffected because income is unchanged. Following the increase in the money stock, agents will attempt to purchase bonds driving up their price and decreasing the interest rate from $r_0$ to $r_1$. Bond prices will rise and the interest rate will fall until the increased money stock is willingly held. Thus, changes in interest rates are the mechanism which re-equilibrates the money market (Husted and Melvin, 2007). The outcome of such a mechanism is the devaluation of the currency in the short run, because some investors leave this market as the interest rate falls.
Given the IRP condition and its application by the Riksbank, we now turn to the PPP condition which is yet another factor that the Riksbank takes into account when stabilizing its economy.

2.2.3 Purchasing Power Parity (PPP)

The Purchasing Power Parity (PPP) is an economic theory that estimates the amount of adjustment needed on the exchange rate between two countries in order for the exchange to be equivalent to each currency’s purchasing power. In other words, the PPP is the ratio or degree of adjustment in the nominal exchange rate needed so that an identical good in two different countries has the same price when expressed in the same currency (Husted and Melvin, 2007).

For example, a chocolate bar that sells for US$1.00 in a US city should cost 1.50kr in a Swedish city when the exchange rate between U.S. and Sweden is 1.50 SEK/US. An increase in the price of chocolate in the US will cause the nominal exchange rate in Sweden to appreciate.

MacDonald and Stein (1999) posit that researchers often turn to the PPP model first when seeking guidance on exchange rate misalignment. The PPP is used either in its basic form in which an equilibrium exchange rate is determined solely by relative prices; or in its monetary extension where the equilibrium rate is determined by relative excess money supplies. The basic form of the PPP is stated as:

\[ P_{SE} = E \cdot P_{e} \]  

where \( P_{SE} \) is Sweden’s price level, \( P_{e} \) is the price level in the Euro zone and \( E \) is the nominal exchange rate needed to purchase the same goods and services at home and abroad (Husted and Melvin, 2007).

Based on “the law of one price”, the PPP suggests that if local prices increase more than foreign prices for the same product, then the local currency would be expected to depreciate vis-à-vis its foreign counterpart, presuming no change in the structural relationship between the countries (MacDonald and Stein, 1999).

The monetary extension of PPP accounts for nominal exchange rate variations by relative ratios of money/GDP. This hypothesis is used by the European Central Bank (ECB) to determine
the relative strength of the € with respect to the $. Based on this hypothesis, the exchange rate ($/€) is expected to remain constant if the European rates of money growth/GDP are the same as those in the US. However, empirical studies have shown that this was not the case. For this reason, the monetary theory of exchange rate is seldom used for analysis (MacDonald and Stein, 1999).

The PPP is used by the Riksbank when setting its inflation target. The Riksbank has an annual inflation target of 2% as measured by the consumer price index (CPI) (Riksbanken, March 2011). The PPP states that a nation’s currency and its CPI should move in opposite directions. Hence, an increase in inflation would devalue the currency thereby decreasing the purchasing power of consumers. An empirical study on this theory shall be seen in section IV. Yet another theory on exchange rate that relates to the price level as captured by the PPP is the productivity effect.

2.2.4 Productivity effect

The Balassa-Samuelson effect or simply the productivity effect is a tendency for countries with higher productivity in traded goods compared to non-traded goods to have higher price levels (Obstfeld and Rogoff, 1996). This theory thus links the real exchange rate to productivity. Here, productivity is considered as an exogenous variable. It maintains that an exogenous increase in the Home country’s productivity in the tradable sector, with productivity in non-tradable held constant, will lead to an appreciation of the real exchange rate, or a fall in the relative price of tradable relative to non-tradable (Harris, 2001).

There are some evidences of the productivity effect on real exchange rate. Gorbachev et al (2001) revealed that almost two-thirds of the appreciation of the dollar was attributable to productivity growth. To add, Alexius (2001) posits that over the long-run 60-90% in real exchange rate changes of the SEK were accounted for by the productivity growth. Closely related to the productivity effect is the GDP.

2.2.5 GDP

The economic growth of Sweden is often indicated by its GDP. It is a measure of the total yearly production of goods and services in Sweden. The GDP in Sweden is one of the factors affecting
the value of its currency. If the growth rate is high, it will indicate an increase in the demand of
the currency and this will trigger an increase in interest rate in order to reduce inflation. This will
also strengthen the value of the currency. Reports on GDP are released quarterly and for an
economy to be healthy, the GDP growth must be at a steady rate. A high growth rate can drive
fears of inflation, though. Moreover, if there is a great discrepancy between the predicted GDP
and the actual GDP, the fear of high market volatility may cause investors to become nervous.
This can lead to economic instability which can devalue the country’s currency.

The above section analyses the relationship between some economic variables and the
real exchange rate. However, research has shown that there are some non-economic factors that
influence movements in the real exchange rate as well.

2.3 Non-Economic factors

This section takes a look at one of the structural factors (administrative policies) and the effect of
the media on real exchange rate volatility.

2.3.1 Politics

Foreign investors tend to watch closely at the state of political affairs in Sweden since this has an
impact on its economy and the ability to repay its debt. In this section, we focus on consistency in
government policies, political administration and stability.

The impact of a political cycle on the value of its currency cannot be underestimated. Here we make a distinction between a political cycle and a business cycle. A political cycle refers
to the term of office of an administration, whereas a business cycle which is the recurring and
fluctuating levels of economic activity over a long period of time. Some stages of the business
cycle include growth, recession and recovery.

The level of confidence that investors place on the Riksdag (Swedish parliament) can be
reflected in the value of its currency. With reference to the U.S. stock market, some studies
reported higher returns for the first and last years of a presidential administration when compared
to others. To add, the stock market returns are usually higher under a Democratic regime when
compared to a Republican administration (Santa-Clara and Valkanov, 2003). Puzzled by such
observations, the authors argue that such differences in returns could not be explained by the business-cycle, nor were such returns concentrated around election dates.

We compared the averaged annual currency for different administrations in Sweden. The evidence on the U.S stock market could not be reflected in the currency data in Sweden. There was no major difference in the value of the SEK for the Social Democrats and Moderate Party; nor were there higher currency values for the first and last years for both leaders (Göran Persson and Fredrik Reinfeldt) (see appendix E).

Furthermore, investors will think of the SEK as a safe bet provided there is some assurance that things will remain the same. Increased holding in the SEK will cause it to appreciate. Conversely, if the Riksdag is volatile in its financial policy, then many investors will withdraw their investments in SEK-denominated assets thereby devaluing the SEK.

2.3.2 Speculation

Some authors maintain that speculation or the anticipation by market participants is often the prime reason for exchange rate movements. These argue that many economists attempt to interpret the phenomenon of deviation of the actual currency values from their fundamental values as speculative bubble (Kallianiotis and Hussain, 2005). Speculators anticipate events even before the release of actual information about them and position themselves accordingly in order to take advantage when the actual data confirms their anticipations. This initial positioning and final reaction accounts for exchange rates volatility. One of such piece of information was: “...on Tuesday February 22, 2005, South Korea’s Central Bank announced plans to diversify its foreign exchange reserves, which traders took to mean a slowdown in purchases of dollar-denominated securities. The U.S. dollar fell to $1.3259 per euro and lost value with respect to the other major currencies” (Kallianiotis and Hussain, 2005).

Here, we notice the reaction of traders before the South Korean’s Central Bank actually diversified its foreign exchange reserves. The first step about speculating is having a belief about an economy and act in a way that is profitable if the belief is actualized.

Thus far, we have analyzed both the economic and non-economic factors that account for the changes in the real exchange rate. Based on these principles, the following section presents an understanding of deviations from such principles (anomalies).
III Calendar Anomalies

Research has shown that returns and the value of assets are sometimes systematically higher or lower depending on the time of the day, day of the week, month of the year, and quarter of the year. Such cyclical patterns in returns are referred to as calendar anomalies. The existence of anomalies in some markets contradicts the efficient market hypothesis which predicts that security prices follow a random walk. This hypothesis suggests that it is impossible to predict future returns based on available information, given that this information are fully incorporated in security prices.

Abnormal patterns in returns suggest inefficiency in the market which is expected to disappear as investors try to exploit them. Evidence of such patterns are simply random and do not necessarily have to be present in other stock or foreign exchange markets (Elton, et al, 2007, p. 404). It is possible that abnormal patterns in the foreign exchange markets are induced by the market structure and order flow of a given currency.

3.1 January effect

In a study on the NYSE from 1941 to 1991, Fama (1991) noticed that returns in the month of January are higher than returns in other months. The extra return is especially high in the first few days of January (Elton, et al, 2007). This suggests that an investor should purchase at the end of December to take advantage of the extra return.

Keim (1989) noticed that there is a tendency for stocks to be at their bid price at the year-end. This phenomenon is more pronounced for small stocks. In addition, small stocks have a higher bid-ask spread and a lower price, and thus the effect would be bigger for small stocks and would partly explain the differences in the January effect (Elton, et al, 2007).

The first explanation given for the January effect is the tax-loss selling hypothesis. This argument posits that the effect is influenced by individual investors who induce capital losses by selling just before year end, securities that have experienced a decline of prices. Such collective
behavior by investors at year-end would produce a fall in stock prices, but in January, when the selling pressure ceases, it results in rising prices and abnormally high returns (Ortiz, et al. 2007).

Yet another explanation for the January effect is the window dressing hypothesis. It is based on the trading behavior of institutional investors around public disclosure reports. Window dressing describes the practice by fund managers in modifying fund holdings in order to improve the disclosed portfolio image, thereby making a good impression on fund unit-holders. A common practice consists in selling loser stocks and purchasing winner stocks, especially just before year-end (Haugen and Lakonishok, 1988; Lakonishok et al, 1991).

### 3.2 Other calendar effects

Mindful of the fact that this paper limits itself to a monthly empirical analysis, this subsection summarizes other calendar effects present in some foreign exchange and stock markets.

#### 3.2.1 Day-of-the-week effect

The Monday or Day-of-the-week effect refers to the tendency of the foreign exchange and stock markets to exhibit relatively large returns on Fridays when compared to those on Mondays. This is quite puzzling because Monday returns span three days. For this reason, returns on Mondays are expected to be higher than on the other days of the week.

Gibbons and Hess (1981) provide us with evidence of such behavior. In a research project on the New York Stock Exchange (NYSE) for the period 1962: 1978, they observed that Mondays’ returns were a negative -33.5% on an annualized basis whereas Wednesdays and Fridays had larger positive returns when compared to the other days of the week (Elton, et al, 2007).

Keim (1989) explains that the negative Monday’s returns results from a tendency for Friday’s closing prices to be the “ask” rather than the “bid” on Monday. This would cause Monday’s prices to be lower even if there were no changes in the bid and ask (Elton, et al, 2007).
3.2.2 *Holiday effect*

The holiday effect refers to the tendency of the market to do well on any day which precedes a holiday. In order to test for this effect, all trading days are classified as pre-holiday, post-holiday, and non-holiday. In a study on the Dow Jones Industrial Average (DJIA) daily returns from 1897 to 1986, Lakonishok and Smidt (1988) observed that the average daily non-holiday return was 0.0094%, while the average pre-holiday return was 0.220%. The pre-holiday return is thus 23 times larger than the average non-holiday return and accounts for approximately 50% of DJIA annual returns. Further evidence of the holiday effect can be found in the works of Rogalski (1984) and Pettengill (1989).

3.2.3 *Quarterly effect*

The quarterly effect refers to the tendency of the foreign exchange and stock markets to exhibit relatively large returns in the last quarter compared to the other quarters. This anomaly is analyzed by comparing the return in the last trading day (LTTD) of a quarter with the return in the first trading day (FTTD) of the next quarter.

In a study of the Spanish Stock Exchange market, Ortiz et al (2010) analyzed the daily Cumulative Abnormal Return (CAR) in the first trading days of a quarter so as to better understand the behavior of stocks. They noticed that the first three quarters do not exhibit a significant return difference; a result consistent with an earlier study on the same market by Miralles and Miralles (2007). However, the last quarter showed evidence of a significant anomaly especially for loser small-cap stocks. (Ortiz, et al, 2010).

The above section discusses the various types of calendar anomalies within the stock market. In the following section, we shall pay close attention to the January effect which shall constitute the corner stone of our empirical study.
IV Empirical Analysis

4.1 Multiple Regression Analysis

Multiple regression analysis is used to assess the influence of exogenous variables (economic factors) upon an endogenous variable (exchange rate) and to measure the level of significance of each independent variable based on a given test statistic (Lind et al, 2005). The result of this analysis is the generation of a linear equation which shows the statistical relationship between the variables. One of the variables is dependent while the others are expected to have explanatory powers.

In this section, we derive the multiple regression equation based on the theory of exchange rate. Thereafter, a multiple regression analysis is performed so as to determine the effect of the explanatory variables (e.g. monthly dummy variables) on the nominal exchange rate. The t-statistic and R² shall be used to evaluate the result of this analysis.

4.1.1 $T$-statistic

The null hypothesis of our $t$-statistic states that the coefficients of the explanatory variables are equal to zero. In other words, the null hypothesis is to reject the presence of calendar anomalies in the real exchange rate. The alternative hypothesis thus accepts the presence of calendar anomalies. In formal terms, let $\hat{A}$ represent calendar anomaly. The null and alternative hypotheses are then stated as:

$$H_0: \hat{A} = 0$$
$$H_1: \hat{A} \neq 0$$

The $p$ (probability) value of the $t$-statistic measures the relevance of our test at different levels of significance. If the $p$-value is less than the level of significance (5%), then $H_0$ is not accepted (Lind et al, 2005). The $p$-value also gives more insight into the strength of our decision. Table 1 gives an insight on how to interpret the $p$-value (Lind et al, 2005).
Is there a January effect in the Swedish Krona?

4.1.2 $R^2$ and adjusted $R^2$

The $R^2$ or coefficient of determination measures the “goodness-of-fit” of the regression line and it describes how well our data set is fitted into the regression line. It is an indicator of how well the monthly dummy variables explain the variation of the real exchange rates. Adjusted $R^2$ ($R^2_{adj}$) gives a more precise determination coefficient for the existing equation. It takes into account the influence of other variables added to the regression equation (Lind et al, 2005).

4.1.3 Time lags

Some explanatory factors may have time lags on the real exchange rate. For example information on inflation rate and GDP are released on a monthly and quarterly base. However, this analysis uses daily nominal exchange rates. For this reason, the time lags are adjusted when computing the influence of such variables on the real exchange rate.

4.2 Testing Economic Theories

4.2.1 Interest Rate Parity (IRP)

The IRP condition was applied to our data set so as to evaluate the validity of the theory. It was observed that the averaged differential for the treasury bills between USA and Sweden for the period 1998:01 to 2010:12 was 1.15. Also, the nominal exchange rate (SEK/$) from 1998:01:02 to 2010:12:30 were 7.955 and 6.8025 respectively. This gives a difference of 1.1525 which is approximately the same as the interest rate differential. These observations are thus consistent with the parity condition for the periods under consideration.

---

Table 1: Significance of P-values

<table>
<thead>
<tr>
<th>P-values</th>
<th>Interpretations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td><em>some</em> evidence that $H_0$ is not true</td>
</tr>
<tr>
<td>0.05</td>
<td><em>strong</em> evidence that $H_0$ is not true</td>
</tr>
<tr>
<td>0.01</td>
<td><em>very strong</em> evidence that $H_0$ is not true</td>
</tr>
<tr>
<td>0.001</td>
<td><em>extremely strong</em> evidence that $H_0$ is not true</td>
</tr>
</tbody>
</table>

---

1 See section 4.3.1
On the other hand, the averaged differential for the treasury bills between Euro and Sweden for the period 1998:01 to 2010:12 was 0.67. Whereas the nominal exchange rate (SEK/€) from 1998:01:02 to 2010:12:30 were 8.71 and 9.002 respectively. This gives a difference of 0.292 which is contrary to our expectation.

4.2.2 Purchasing Power Parity (PPP)

The PPP equation (17) above states that:

\[ P_{SE} = E \times P_€ \]

This can be written as:

\[ P_{SE} / P_€ = E \]

The Riksbank has an annual inflation target of 2% as measured by the consumer price index (CPI) (Riksbanken, March 2011). The PPP states that a nation’s currency and its CPI should move in opposite directions. Hence, an increase in inflation would devalue the currency, thereby decreasing the purchasing power of consumers. The correlation coefficient explains the effect of one variable (inflation rate) on the other (exchange rates). When the nominal exchange rates (SEK/€ and SEK/$) were correlated with the inflation rate in Sweden for the period 1998:01 to 2010:12, we found that the correlation coefficients for SEK/€ and SEK/$ were 0.0434 and 0.0965 respectively. This implies that the Swedish inflation rate accounts for only 4% and 10% of the SEK/€ and SEK/$ respectively.

![Figure 4: Yearly fluctuations in Inflation rates](source: Ekonomifakta)
4.3 Research Methodology

4.3.1 Data Selection

The Swedish banks calculate a daily fixing rate of the krona at 9:30 am, according to the formula: \((\text{bid}+\text{asked})/2\). At 10:05 am the Stockholm Stock Exchange sets a joint MID-PRICE by calculating the aggregate of the banks' fixing rate. It is on the basis of this MID-PRICE that the exchange rates of the krona against other currencies are calculated (Riksbanken, March 2011).

The choice of cross rates with the Swedish Krona was based on the level of trade between Sweden and its counterparties. According to Statistics Sweden, the USA and the Euro zone are the largest trading partners with Sweden.

The Treasury Bills was used as an indicator of interest rates. The data set for the daily nominal exchange rates and the Treasury Bills for Sweden were downloaded from the Riksbank’s webpage. It covers the period from: 1998:01 to 2010:12. This data set was transformed into monthly data with the help of excel in order to perform the necessary regression analysis. The inflation rates for Sweden, the Euro zone, and the U.S were retrieved from online databases: Statistics Sweden (SCB); European economy statistics and Bureau of Labor Statistics respectively. Data on inflation rates are released by the central bank on a monthly basis. The data for Sweden and foreign consumer price indexes (USA, Euro) was obtained from the Organization for Economic Co-operation and Development (OECD) Main Economic Indicators (MEI) online database. These variables were used to estimate the regression equation.

4.3.2 Regression Equation

As stated above, the real exchange rate equation is given as

\[\text{re} = E \ast \frac{P^f}{P}\]  \hspace{1cm} (13)

where \(P\) denotes the domestic price level, \(P^f\) denotes the foreign price level, \(E\) is the nominal exchange rate, and \(re\) the real exchange rate. This can be re-written as:

\[E = \text{re} \ast \frac{P}{P^f}\]  \hspace{1cm} (14)

Taking the logarithm of this equation gives:

\[\ln E(t) = \ln re(t) + \ln P(t) - \ln P^f(t)\]  \hspace{1cm} (15)
Differentiating equation (17) with respect to time \( t \), gives

\[
\frac{\hat{E}}{E} = \frac{\hat{r}_e}{r_e} - \frac{\hat{p}}{p} + \frac{\hat{p}_f}{p_f}
\]  

Using a simpler notation and allowing for some additions, equation (16) can be modified to:

\[
g_E = \alpha_0 \cdot t + \alpha_i \left( g_p - g_{p,f} \right) + c
\]  

Where

- \( g_E \) = the nominal exchange rate
- \( \alpha_0 \) = regression coefficient for the real exchange rate as a function of time, \( t \)
- \( \alpha_i \) = regression coefficient for inflation differential
- \( g_p \) = domestic CPI (Inflation rate)
- \( g_{p,f} \) = foreign CPI (Inflation rate)
- \( c \) = accounts for the monthly dummy variables

The first right hand term implies that the real exchange rate is assumed to follow a linear time trend. The constant in the next term is equal to unity according to the theory. Equation (17) shall be used for the multiple regression analysis. The result of this analysis is presented in the following section.

4.4 Result of January effect

In this Section, we present the results of the regression analysis. Here, we assume that there is no transaction cost, and that the investor is a daily trader, for the simple reason that daily data on nominal exchange rates are used in the analysis. The results for the monthly regression estimates are computed from the daily data.

As stated above a January effect implies that expected returns are higher in January than during the rest of the year. It does not imply that excess returns are possible by taking a long position in January and a short or neutral position in the rest of the year. Rather, a January effect
test compares the daily average return to the rest of the year. The following econometric model was tested:

\[ g_E = \alpha_0 \cdot t + \alpha_1 (g_{p'} - g_p) + \beta_1 M_1 + \beta_2 M_2 + \beta_3 M_3 + \beta_4 M_4 + \beta_5 M_5 + \beta_6 M_6 + \beta_7 M_7 + \beta_8 M_8 + \beta_9 M_9 + \beta_{10} M_{10} + \beta_{11} M_{11} + \beta_{12} M_{12} \]  

(20)

where \( \beta_i \) and \( M_i \) are the monthly arithmetic means and monthly dummy variables respectively. The values for \( M_i \) were calculated using the formula \( ROR = \ln(c_1/c_2) \), where \( c_1 \) and \( c_2 \) are the nominal exchange rates of yesterday and today respectively. This econometric model resulted in the equations below for exchange rates SEK/€ and SEK/$ respectively:

\[ g_{E€} = \alpha_0 \cdot t + 0.67(g_{p'} - g_p) + 0.0097M_1 + 0.005M_2 + 0.004M_3 + 0.008M_4 - 0.004M_5 - 0.002M_6 + 0.000033M_7 - 0.001M_8 - 0.001M_9 \]
\[ - 0.005M_{10} - 0.002M_{11} - 0.006M_{12} \]

\[ g_{E$} = \alpha_0 \cdot t + 1.15(g_{p'} - g_p) - 0.006M_1 - 0.009M_2 + 0.003M_3 + 0.012M_4 - 0.003M_5 - 0.003M_6 + 0.009M_7 - 0.007M_8 + 0.014M_9 - 0.011M_{10} - 0.001M_{11} + 0.014M_{12} \]

<table>
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<tr>
<th>Monthly Rate of Return</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M7</th>
<th>M8</th>
<th>M9</th>
<th>M10</th>
<th>M11</th>
<th>M12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro</td>
<td>0.97%</td>
<td>-0.5%</td>
<td>0.4%</td>
<td>0.8%</td>
<td>-0.4%</td>
<td>-0.2%</td>
<td>0.003%</td>
<td>-0.1%</td>
<td>-0.1%</td>
<td>-0.5%</td>
<td>-0.2%</td>
<td>-0.6%</td>
</tr>
<tr>
<td>USD</td>
<td>-0.6%</td>
<td>-0.9%</td>
<td>0.3%</td>
<td>1.2%</td>
<td>-0.3%</td>
<td>-0.3%</td>
<td>0.9%</td>
<td>-0.7%</td>
<td>1.4%</td>
<td>-1.1%</td>
<td>-0.1%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

*Table 2: Monthly Arithmetic Mean from 1998:01 to 2010:12*

The analysis of the exchange rate SEK/€, shows that January had the highest rate of return (0.97%). March and April also had positive returns of 0.44% and 0.82% respectively. However, all the other months had either very low (M7) or negative rates of return. The average rate of return for the entire period (1998:01 to 2010:12) was -0.02%.

The monthly rate of return was aggregated from the daily rates of return mindful of the fact that the daily nominal exchange rate data was used in this analysis. Consequently, we define the monthly rate of return as the return an investor gets if he trades on a daily basis in a given month.
Also, given that the Stockholm Stock Exchange (OMX) sets a joint MID-PRICE by calculating the aggregate of the banks' fixing rate as of 10:05am, then an investor makes a trading decision(i.e. a decision to either buy or sale a given currency) after 10:05am and before 10:05am the following day.

Figure 4.2 presents the monthly rates of return, that is, it plots the information in Table 2. Unlike the exchange rate for SEK/€, there is no evidence of a positive trend in January for the exchange rate SEK/$. On the contrary, September, December, April, July and March showed positive returns in order of magnitude, whereas the returns for January and the other months were negative.

![Figure 5: Monthly Rate of Return 1998:2010](image-url)
Table 3 t-statistics

The $p$-value for SEK /€ in January was 0.133. This suggests that there is very little evidence to reject the $H_0$ (absence of anomaly) at a 95% confidence level. Also, from the t-statistics we notice that January had the highest level of significance (1.514) when compared to the other months. Nonetheless, the acceptance of $H_1$ (presence of anomaly) would require a t-statistic $\geq 2$ in absolute terms.

It was noticed that the differential inflation rate (EU-SE) had very little explanatory power on the real exchange rate for SEK /€. A possible explanation could be that the EU has the same inflation target as that of Sweden (2%). By ignoring this variable, the value of the t-statistics increases to a level significant enough to affirm the presence of a January effect. However, the regression equation (20) would be altered which is contrary to our goal.

In addition, the adjusted $R^2$ for this analysis was 0.7% which gives a very poor data fit into the regression equation. A possible explanation could be that too many variables are used in the regression equation which tends to add more noise in the analysis. In a regression analysis with only M1 (January) as the dummy variable, we noticed an increase in the $p$-value, adjusted $R^2$ and t-statistic to 0.4, 1.14% and 2.07 respectively. However, the adjusted $R^2$ value further justifies the $H_0$ (absence of anomaly).

Likewise, there is no evidence of a January effect in the real exchange rate for SEK /$. The rate of return in January was among the lowest, and the t-statics was highly insignificant. September had the highest level of significance (1.4). Given the above reasons, we find no evidence in support of the January effect in any of the exchange rates.
V Conclusion

The goal of this paper was to investigate the possible existence of a January effect (anomaly) in the Swedish Krona (SEK) based on some economic variables affecting the real exchange rate. Following the change in exchange rate regimes from fixed to flexible in 1993, the value of the SEK has become endogenous, that is, influenced by market forces. Nonetheless, the Swedish government uses fiscal and monetary policies to influence the value of its currency. The destabilizing and re-equilibrating of the SEK resulted in time lags which were accounted for in the regression analysis.

The focus on the January effect was due to the fact that the variables used in the multiple regression analysis (such as inflation) are released on a monthly base, except for the daily nominal exchange rate. The results of our analysis showed some likelihood of the January effect for the exchange rate SEK/Euro. Nonetheless, the regression estimates, judging from the $p$-values and $t$-statistics were not significant enough to affirm the presence of a January effect.

Moreover, the “small stock” effect is often used as to partly account for the January effect. The price levels of the nominal exchange rates can be classified as “small stock” which was expected to increase the likelihood of the January effect. However, this was not the case.

Possible reasons for the absence of the January effect and yet a distinctive return pattern in January could be the influence of information on the BoP released at year-end or by order flows in January. However, this puzzling outcome suggests further research using other statistic methods such as bootstrapping or the GARCH model.

Another area of interest would be to investigate the presence of the January effect with the regression equation derived from the monetary extension of the PPP, that is, relative ratios of money/GDP.
REFERENCES

Books and Articles


Is there a January effect in the Swedish Krona?


Web References


Calendar Anomalies Retrieved on April 5th, 2011 from http://calendar-effects.behaviouralfinance.net/january-effect/.


Statiscal Data


Is there a January effect in the Swedish Krona?

U.S. Treasury bill with 3 months maturity, retrieved on February 21st, 2011 from
Is there a January effect in the Swedish Krona?

Appendix

Appendix A: Regression estimates between SEK/€ and the monthly dummy variables

<table>
<thead>
<tr>
<th>SUMMARY OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Statistics</td>
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<tr>
<td>Multiple R</td>
</tr>
<tr>
<td>R Square</td>
</tr>
<tr>
<td>Adjusted R Sq</td>
</tr>
<tr>
<td>Standard Err.</td>
</tr>
<tr>
<td>Observations</td>
</tr>
</tbody>
</table>

| ANOVA |
|-----------------|-----------------|
| df | SS | MS | F | Significance |
|-----------------|-----------------|-----------------|-----------------|
| Regression | 14 | 0.00403829 | 0.000288488 | 0.929133883 | 0.529427509 |
| Residual | 142 | 0.044089732 | 0.000310491 | #N/A | #N/A |
| Total | 156 | 0.048128561 | #N/A | #N/A | #N/A |

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
<th>P-value</th>
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<th>Upper 95%</th>
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<tbody>
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<td>Intercept</td>
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<td>M9</td>
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<td>M12</td>
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<tr>
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<td>0.0000321</td>
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Appendix B: *Regression estimates between SEK/$ and the monthly dummy variables.*

**SUMMARY OUTPUT**

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Appendix C: Regression estimates between SEK/€ and the monthly dummy variables (part 2).

**SUMMARY OUTPUT**

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Appendix D: The effects of political administration on the SEK.

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