Are We Floating Yet? Duration of Fixed Exchange Rate Regimes*

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Abstract

In this paper we study the determinants of choice of exchange rate regime. We investigate the factors that may influence the probability of a switch from a fixed to a flexible exchange rate regime using survival models. The use of survival models allows us to test if a switch to flexible exchange rate regime is dependent on the time spent on a fixed exchange rate regime. We use the non-parametric Kaplan-Meier estimator and a proportional hazard Cox model to show that exchange rate regimes, namely fixed exchange rate regimes, have non-monotonic influences on the probability of abandoning a peg in favor of a floating currency policy. These results are robust even when we account for possible country intra-correlation through marginal risk analysis.

Keywords: Exchange rate, survival model, marginal risk analysis.

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1 Introduction

The frequency of currency crises in the past decade has brought renewed interest in the issue of optimal exchange rate policy. This interest was further fueled recently as we watched pegged economies (i.e. Estonia, Latvia, and Bulgaria) face the decision to abandon their fixed exchange rate regimes or face a severe recession during the current global financial crisis. Economists are particularly interested in the nature of these exits and their macroeconomic, financial and institutional determinants.

In this paper we argue that time is an important concept for the analysis of transition between exchange rate regimes. In particular, we argue that the probability of an exit from a particular exchange rate regime is likely to be determined by the time spent within a given regime. To this effect, we study the conditional probability of a particular exchange rate regime ending by adopting a duration model for various countries. The duration of a given exchange rate regime is important in assessing currency stability. Exchange rate credibility depends not only on the reaction to speculative attacks, but also on the time already spent in a regime for which a particular currency does not suffer from a speculative attack. Furthermore, we explicitly account for intra-correlation within countries' choice of exchange rate regime through marginal risk analysis, using the Andersen and Gill (1982) and Wei et al. (1989) models.

The choice of exchange rate regimes is extensively explored in the international finance literature. The determinants of which types of exchange rate regimes should be implemented depending on a country's characteristics have been theoretically predicted (see Mundell (1961), McKinnon (1963), Rizzo (1998), Frankel (1999), Fischer (2001), Poirson (2001), Juhn and Mauro (2002), VonHagen and Zhou (2007), Carmignania et al. (2008)). The determinants of the choice of currency policy are argued from several perspectives including optimal currency areas, currency crises, and policy credibility. However, the existing literature could not identify a single generalizable variable as an unquestionable determinant of exchange rate choice.

Empirical studies which aim to uncover the determinants of exits from one exchange rate regime to another seem to also be plagued with the problem of not having a single generalizable determinant of the choice of exchange rate regime, instead these studies provide varying results for the determinants of choice of exchange rate regimes depending on the definitions of an exchange rate regime classification, the definition of exit from an exchange rate regime, the time periods covered, the sample of countries used, the econometric methodology, and explanatory variables utilized.

Most of the empirical studies undertaken in the estimation of the determinants of exchange rate regime choice so far have been of the probit and logit nature (Kumar et al. (1998), Eichengreen et al. (1995), Klein and Marion (1994), Masson and Ruge-Murcia (2003)). As such, they are unable to account for the time dependence that may be present in the decision to abandon a fixed exchange rate regime in favor of a flexible exchange rate regime. Ideally, the empirical model to be used in the estimation of the determinants of exchange rate regime choice should take into consideration two conditions: the possibility of non-monotonic time-dependence and the effect of intra-correlation. First, the probability regime switch depends on economic and institutional characteristics as well as time spent in a particular exchange rate regime. Moreover, the time-dependence may be non-monotonic resulting in a probability of exit from an exchange rate regime which increases during short duration but decreases for longer duration. The empirical studies that tried to address the duration dependence that could affect the choice of exchange rate regimes are limited (Setzer 2004), (Tudela 2004), (Walti 2005). None of the empirical studies provide a comprehensive analysis for different types of economies (i.e. industrial, emerging, developing) using *de facto* exchange rate regimes.

Second when analyzing multiple exit (failure) times of the same time there is a potential for a lack of independence of the failure times[1]. These correlated exit times

[1]A possible source of correlated failure times of the same event type are familial studies, in which

from a particular exchange rate regime are important for they set up the platform for establishing the probabilities to possible realignment of exchange rate policy. Yet, none of the afore mentioned duration studies attend to the possibility of intra-subject correlation.

This paper contributes to the literature by expanding on the works of Tudela (2004) and Walti (2005) in four ways. First, the paper analyzes the duration dependence of exits from a fixed exchange rate regime and whether these exits are non-monotonically dependent on time. Second, the paper utilizes Reinhart and Rogoff (2004)'s *de facto* classification of exchange rate regime following Walti (2005). Third, Tudela (2004) and Walti (2005) both focus on a subset of countries and monthly or quarterly data. Using high frequency data creates more exchange rate regime switches (observations), however does not correspond with the long-run behavior of exchange rate choice. In the same token, having a larger sample of countries provides broad evidence base about how countries choose their exchange rate systems. Therefore we use a data set that has a more comprehensive list of countries and a longer period (annual) of observation. And finally, the paper addresses the possibility of the decision to abandon a peg being intra-correlated, that is the risk of abandoning a fixed exchange rate regime depends on previous exits from a fixed exchange rate regimes to floating exchange rate regimes, through the use of marginal analysis. To our knowledge, no such empirical work has been carried out.

Our results reveal that the probability of an exit from a fixed exchange rate regime is non-monotonically time-dependent. To control for country-specific heterogeneity, we include time-varying covariates in the Cox proportional hazard model. The findings from the semi-parametric approach suggest that some factors, such as GDP growth, could affect the probability of a switch from fixed to flexible exchange rate regimes. These findings are confirmed through the marginal risk analysis.

each family member is at risk of developing a disease of interest. Failure times of family members are correlated because they share genetic and perhaps environmental factors. Another source of correlated failure times of the same type are studies where the same event can occur on the same individual multiple times.

The remainder of the paper is organized as follows: Section 2 discusses the empirical model, while section 3 presents the data. Then section 4 presents empirical results and in section 5 we provide concluding remarks.

2 Econometric Methodology

Let T be a nonnegative variable which represents the length of time a country spends in a certain type of exchange rate regime, or the duration (spell) of that exchange rate regime. In our study T represents the time during which a country is in a fixed exchange rate regime until the exit to a floating exchange rate regime. The random variable T can be described through its cumulative distribution function given by

$$F(s) = \int f(s)ds = Pr(T \leq t), \tag{1}$$

where the probability density function, $f(t)$, represents the probability that an exchange rate regime will survive less than some given value t.

The survival function, which describes the probability that the regime will last t periods or longer, is given by

$$S(t) = 1 - F(t) = Pr(T > t) \tag{2}$$

$$\text{for } t = 0, S(t) = 1 \text{ and for } t = \infty, S(t) = 0.$$

Duration analysis focuses on conditional probabilities. To this effect the hazard function becomes a central concept. The hazard function determines the instantaneous probability that an exit from a particular exchange rate regime will occur in $t + \Delta t$, given the exchange rate regime has survived up to time t. Thus the hazard function [2] is defined as

[2]The hazard function, sometimes known as the hazard rate, contains the same information as

$$\lambda(t) = \lim_{\Delta t \to 0} \frac{Pr(t \leq T \leq t + \Delta t)}{\Delta t} = \frac{f(t)}{S(t)}. \tag{3}$$

The estimation of the hazard function requires some assumptions about the duration pattern. If such assumptions cannot be made the non-parametric approach of Kaplan-Meier estimation allows for a preliminary analysis of duration dependence. The graphed hazard function by the Kaplan-Meier estimator affords us the opportunity to test whether time already spent in a fixed exchange rate regime has an independent effect on the likelihood of an exit into a flexible exchange rate regime beyond the control of time-varying variables. However, the non-parametric Kaplan-Meier estimator does not allow the inclusion of constant or time-varying explanatory variables.

To incorporate time-varying covariates, the Cox (1972) approach of proportional hazard is used to specify the duration model. This semi-parametric method requires less than complete distributional specification of the base-line hazard. Given the lack of theory regarding the duration of fixed exchange rate regimes, the proportional hazard model seems a reasonable compromise between the non-parametric approach of Kaplan-Meier estimator, which does not allow for various explanatory factors, and the possibly wrongly specified parametric approach.

The Cox proportional hazard model assumes that covariates shift the baseline hazard multiplicatively. As such in a continuous time and with time-varying covariates it is introduced in the following functional form:

$$\lambda(t, x(t), \beta) = \lambda_0(t)\phi(x(t), \beta), \tag{4}$$

where $\lambda_0(t)$ is the baseline hazard, $\phi(x(t), \beta)$ is a function of $x(t)$, which are time-varying regressors, and a vector of unknown coefficients β. In a semi-parametric model the baseline hazard $\lambda_0(t)$ has an unspecified functional form and represents

the probability density function but duration dependence is easily interpreted based on the shape of the hazard function.

the case where $x(t) = 0$. In other words, the baseline hazard provides the hazard function for a mean country and information about duration dependence. The explanatory variables found in $x(t)$ shift the hazard function for different countries with given length of time spent in a given exchange rate regime by multiplying the baseline hazard.

The most common choice of $\phi(x(t), \beta)$ is the exponential form

$$\phi(x(t), \beta) = \exp(x'(t)\beta), \tag{5}$$

ensuring that $\phi(x(t), \beta) > 0$ and allowing coefficient to be easily interpreted.

In this paper, the duration of countries on fixed exchange rate regimes is measured in terms of years. But the exact time in the year is not given. In such a case the transitions from a fixed exchange rate regime to a non-fixed exchange rate regime is said to be grouped. Discrete-time proportional hazard models handle this type of data better than continuous-time proportional hazard models. In discrete-time proportional hazard model the regressors are constant within the interval but can vary across intervals, while the baseline hazard,$\lambda_0(t)$, can vary within the interval. In implementation the complementary log-log model is utilized. The complementary log-log hazard function after some algebra becomes [3]

$$h(t) = 1 - \exp(-\exp(x'(t)\beta + \gamma(t))), \tag{6}$$

where $\gamma(t) = \ln \int_t^{t+1} \lambda_0(s)ds$.

[3]

$$\begin{aligned} h(t) &= 1 - \exp(-\exp(x'(t)\beta)) * \int_t^{t+1} \lambda_0(s)ds = 1 - \exp(-\int_t^{t+1} \lambda_0(s)ds[\exp(x'(t)\beta)]) \\ &= 1 - \exp(-\exp(\ln(\int_t^{t+1} \lambda_0(s)ds) + x'(t)\beta)) \end{aligned}$$

In order to estimate the unknown parameters β and $\gamma(t)$, we have to express the probabilities presented in the hazard function in terms of a likelihood function. The log-likelihood for the contribution made by the i^{th} country observation in the interval t_j is then given by

$$L_i(\theta) = d_i \ln(h_i(t)) + \sum_{t=1}^{t_{j-1}} \ln(1 - h_i(t)), \tag{7}$$

$$L_i(\theta) = d_i \ln(1 - \exp(\exp(x'(t)\beta + \gamma(t)))) - \sum_{t=1}^{t_{j-1}} \exp[x'(t)\beta + \gamma(t)], \tag{8}$$

where θ is the set of parameters to be estimated and d_i indicates whether the i^{th} spell is censored or not[4]. If $d_i = 1$ the spell is uncensored- the transition from a fixed exchange rate regime to a flexible exchange rate regime is observed- and if $d_i = 0$ the i^{th} observation is censored, implying the transition is not observed.

Furthermore, we need to consider that our data consists of N countries each of which has multiple-cycle data, where countries experience multiple transitions. Hence, the a hazard function may depend upon the number of previous spells of fixed exchange rate regime (*occurrence dependence*) as well as the lengths of previous time spent in the fixed-exchange rate regime state (*lagged duration dependence*). As such conducting an analysis of multiple transition data by just examining time to first event, ignoring additional failures, is inadequate because it wastes possibly relevant information. Thus, in order to incorporate multiple spells, the partial likelihood framework needs to be utilized where the log-likelihood function or a given country incorporates different transition intensities[5]. Let us define $d_c = 1$ if a fixed exchange rate regime is abandoned at the end of the c^{th} cycle and 0 otherwise. Then, a country observed over C_i cycles will have the following log-likelihood function:

[4] A spell is censored when we do not observe the duration of the spell until its conclusion.

[5] Multiple spells occur when a country can fix the exchange rate for some time, then float, then fix again according to our definition of fixed exchange rate regimes.

$$
\begin{aligned}
L_i(\theta) &= \sum_{c=1}^{C_{i-1}} [\ln[h_i^c(t_c^i, s_c^i, t_j)] + \sum_{c=1}^{t_{j-1}} \ln[1 - h_i^c(t_c^i, s_c^i, t)] \\
&\quad + d_i \ln[h^{C_i}(t_{C_i}, s_{C_i})] + \sum_{t=1}^{t_{j-1}} \ln[1 - h^{C_i}(t_{C_i}, s_{C_i}, t)], \qquad (9)
\end{aligned}
$$

where the last cycle of each country may be right censored or result in an exit and $h(.)$ is given by Equation (6). Furthermore, the baseline rate in this estimation has been defined through a set of dummy variables. This function, known as the piecewise constant(PWC) hazard model, is a proportional hazard model, which lets the baseline hazard be a step function with k intervals, where the hazard is constant in each interval, but may vary from one interval to the other.

While PWC model is one proportional hazard approach to conducting duration analysis for multiple-cycle data, a major issue in extending the proportional hazard models to multiple events per country is the intra-subject correlation(Therneau and Grambsch 2000) . As previously stated, this problem can be sidestepped by only taking time until first exit from a peg; however important information on the exit process will be lost. When a given country may contribute multiple events, the assumption of independent observations in the standard Cox model does not hold. Marginal models offer flexibility in the formation of strata and risk sets, definition of the time scale, and have a well-developed estimator of the variance.Lipsitz et al. (1990) showed that marginal models can overcome this assumption for the estimation of the variance of β by an appropriate correction based on a grouped jackknife estimate[6].

Another important issue in multiple events data is to distinguish between data sets where the multiple events have a distinct ordering and those where they do not.

[6] Although unbiased, this grouped-jackknife estimate is typically more variable than the ordinary variance of the Cox model, but it is a robust variance that adequately addresses repeated event correlation.

In the particular case of this study, the outcome of leaving a fixed exchange rate regime is ordered. A country cannot have its second exit from a peg before its first. To account for such ordered events with possibility of being correlated we utilize two common approaches: the independent increments model (Andersen and Gill 1982), and marginal (Wei et al. 1989) model. Both are marginal regression models in that the estimated $\hat{\beta}$ is determined from a fit that ignores the correlation between the events followed by a correction of the variance, but differ considerably in their creation of the risk set.

The Andersen and Gill (1982) (AG)model is the simplest method, but it makes the strongest assumptions. Each country is represented as a series of observations with non-overlapping time intervals, where the end of time for each interval is determined by an occurrence of an exit or change in any time-varying covariates. The AG model makes the assumption that events are equal and thus treats them independently. This allows the exit to be measured as time to first exit, time from first exit to second exit and so on (Cleves 2002). Each country contributes to the risk set for a specific time as long as they are under observations, as defined by inclusion of the specified time in the country's interval set[7].

The AG model is a counting process approach. The difference between the AG model and the standard Cox model can be seen through the definition of the hazard function. The intensity process for subject i in the AG model is given by

$$h(t) = Y_i(t)\lambda_0(t)\exp(X_i(t)\beta), \tag{10}$$

where $Y_i(t)$ is the indicator function that country i is still under observation at time t, $\lambda_0(t)$ is the baseline hazard, X_i denotes the covariate vector for country i, and β is

[7]While the Andersen-Gill formulation has a number of advantages, including the ability to accommodate left-censored data, time-varying covariates, multiple events, and discontinuous intervals of risk, a major limitation of this approach is it doesn't allow more than one event to occur at a given time. Some of these practical advantages are discussed in an applied framework by Johnson et al. (2004).

a vector of coefficients. In the standard Cox model, the individual country ceases to be at risk when the event exit from a peg occurs and $Y_i(t)$ takes value zero, but for AG model for recurrent events, $Y_i(t)$ remains one as exits occur until the last time the exit is observed.

In the Wei et al. (1989) (WLW) model, the ordered outcome data set is treated as if it were an unordered competing risk case. The number of strata in the analysis will be equal to the maximum number of exits a country experiences in the time period. Unlike the AG model, the WLW model allows for a separate underlying hazard for each exit[8]. In the WLW model a country is at risk until the country exits a peg or there is censoring. Hence, the hazard function for the j^{th} event for country i becomes

$$h(t) = Y_{ij}(t)\lambda_{0j}(t)\exp(X_i(t)\beta_j). \tag{11}$$

$Y_{ij}(t)$, the at-risk indicator for the i^{th} country, is one until the occurrence of the j^{th} exit. If the j^{th} exit occurs or if there is censoring then $Y_{ij}(t)$ becomes zero, indicating that the country is no longer at risk after the last given exit[9].

We proceed in this paper in three steps. First, we estimate the hazard function utilizing the non-parametric estimator which can illustrate the duration dependence in graphical form. Second, we conduct semi-parametric analysis with time-varying covariates to see if the patterns in duration dependence could be explained by time-varying factors. In particular, using the Piecewise Constant (PWC) proportional hazard framework allows us to estimate the unknown parameters without specifying

[8]The AG and WLW models are the same in that we get a single set of covariates that are constant across the event ranks.

[9]Metcalfe and Thompson (2007) have shown that the WLW model infringes on the proportional hazards assumption when applied to multiple spells, maybe causing a bias. However, they have also shown that such a a bias is not behind the distinctive effect estimates and also that the infringement of the proportional hazards assumption is not necessarily greater than the experienced with other applications of proportional hazards regression. As such we do not see a prohibition to the application of the WLW method to the multiple spells data.

the form of the base-line hazard. Moreover, we can address the possibility of occurrence dependence and duration dependence through time dummies. And finally, we introduce marginal analysis to treat multiple events from a country without violating the assumption that events per subject are independent. Marginal models, namely the AG and WLW models, will be able to explicitly account for intra-subject correlation by replacing the standard variance estimate with one which is corrected for possible correlations.

3 Data

3.1 Classification of Exchange Rate Regime

The classification of exchange rate regimes has some variation in different studies. The predominant number of the studies focuses on the official *de jure* exchange rate regime classification retrieved from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*, which is based on official declarations made by national governments once a year (Klein and Marion 1994). The obvious problem with this form of classification is that many countries which declare having floating exchange rates are characterized by pegs and many announced pegged regimes turn out to be a more flexible regime (Obstfeld and Rogoff (1995),Calvo and Reinhart (2002)). On the other hand some studies have constructed their own indicators to define exchange rate regime (Tudela 2004) , while other research uses pure or hybrid *de facto* classification (Reinhart and Rogoff (2004),Setzer (2004),Levy-Yeyati and Struzenegger (2002),Duttagupta and Otker-Robe (2003)).

We use Reinhart and Rogoff (2004)'s annual *de facto* classification of exchange rate regime and group exchange rate regimes into two categories: fixed regimes and floating regimes. The constructed *de facto* classification is chosen for three main reasons. First it avoids identifying short spells of exchange rate stability as regimes. Unlike other *de facto* classifications which identify short-term spells of exchange rate stability within a regime, Reinhart and Rogoff (2004) identify longer-term regimes by considering a five-year horizon.

Second, it takes into account the fact that countries may have dual or multiple exchange rates and/or parallel markets. Failing to look at market-determined rates can lead to misleading perceptions about the underlying monetary policy and the ability of the economy to adjust to shocks. This can results in an underlying inflationary monetary policy which may not be captured by the official exchange rate.

Finally, the Reinhart and Rogoff (2004) *de facto* classification is not based on official declaration but rather on the action of monetary authorities, avoiding a possible discrepancy between officially reported exchange rate regimes and the actual characterization of the exchange rate regimes in the countries. Previous empirical studies on exchange rate regimes that relied on the classification available from the *Annual Report on Exchange Arrangements and Exchange Restrictions* published by the IMF were missing important information[10].

3.2 Definition of Exits

Duration of a spell in this study is defined as the time that a currency is pegged. We define an exit from a fixed to a flexible exchange rate regime as the shift from a strict fixed category to announced pegs, crawling pegs, managed float or free floating exchange rate regime[11]. The sample period extends from 1970 to 2007. Each duration period corresponds to the number of years from the time of origin until an exit. If a regime is still in place by the 2007 we register the observation as being censored.

The Kaplan-Meier calculation of the hazard function makes use of the number of regimes that are eligible to exit, and this number will capture the fact that these

[10]For other *de jure* and *de facto* classifications see (Shambaugh 2004), (Bubula and Otker-Robe 2002), (Ghosh et al. 2002),and (Levy-Yeyati and Struzenegger 2002)

[11]We define an exit from a fixed exchange rate regime as a shift from categories 1 or 2 to categories 3 or 4 using Reinhart and Rogoff (2004)'s coarse grid.

regimes are not at risk of exiting a fixed exchange rate regime (since they all survived) until they come under observations. The semi-parametric approach uses only observation at times of exit. The simple fact that a regime is observed in 1970 means that it did not exit a fixed exchange rate regime before. This is true for all regimes observe in 1970, so none of these regimes could have abandoned a peg before that date. Hence, we would not have any observation to contribute to the partial likelihood.

3.3 Time-Varying Variables

As determinants of the likelihood of exit from a peg, country-specific time-varying variables are selected on the basis of empirical studies dealing with the determinants of the optimal choice of exchange rate regimes. Macroeconomic variables include inflation, economic growth, openness, current account balance, real exchange rate, unemployment, and claims on government. Financial variables consist of net foreign assets as ratio of GDP, international reserves and domestic credit. Finally, the quality of institutions, proxied by an index of political rights, is added[12]. Table 1 presents the explanatory variables and their expected signs. The expected signs are based on the findings of previous empirical studies using duration analysis. The data assembled is annual data from 1970 through 2007 for 144 countries. The database for most of the variable is the *World Development Indicators* published by the World Bank, *Polity IV* data set, and *External Wealth of Nations provided* by Philip Lane.

4 Empirical Results

Before explaining the result of our estimates, we have to report some of the characteristics of the duration of the spells. Recall that a spell is defined as the time that a particular country is in a fixed exchange rate regime. Information about the duration of the pegs is provided in Table 2. We see that we have 4,942 years of pegs

[12]In order to avoid feed back effects of the occurrence of a switch from a peg into macroeconomic variables,variables from year t are used to determine the probability of exit from the peg in year $t+1$.

(among all countries). Also we see that the number of years on a fixed exchange rate regime is the highest in year 38 (23.07%), which reflects the right censoring of the data.

Table 3 provides information on the exit rate from a fixed exchange rate regime to a floating exchange rate regime. It is worth noting that about one third of the spells in our sample end in the first 10 years of the peg. It should also be noted that both Table 2 and Table 3 account for duration and exits where countries could have multiple exits. In fact, Table 4 presents how many observations have multiple exits. About 49 percent of our observations are right censored (meaning there is no exit from the peg), while about 33 percent our observation experience only one exit from a peg. The remaining 19 percent of our observation experience multiple exits from a peg. These multiple exits reaffirm the existence of *multiple-cycle* in the data. In this case, the hazard function may depend upon the number of previous entries to the pegged state (*occurrence dependence*) or it may depend upon the lengths of previous visits to the pegged state (*lagged duration dependence*).

4.1 Baseline Hazard Rate

Probability of exit from a fixed exchange rate regime to a floating exchange rate regime can be graphically illustrated with the non-parametric Kaplan-Meier estimator. Figure 1 presents the smoothed hazard estimate and the estimated hazard function obtained with the Kaplan-Meier estimator. A clear non-monotonic pattern of duration dependence appears. More precisely, it starts out increasing, reaches a peak then starts decreasing. Duration dependence can not therefore be qualified as positive nor negative, it depends upon survival time. What can explain this non-monotonic shape? It could be that at the very beginning of the peg that agents are not very confident in the peg. Then, as the peg goes on, conditional on survival up to a certain threshold, the probability of an exit from the peg starts to decline. Although, the duration dependence is not clearly linear, negative duration dependence exists after approximately 12 years on a fixed exchange rate regime, showing that the probability of leaving the peg decreases with duration. The integrated hazard function in Figure 2 confirms the evidence in favor of a non-monotonic pattern of duration dependence. Moreover, the non-monotonic relationship between time spent within a fixed exchange rate regime and the probability of exit from a peg is illustrated through the estimated base-line hazard in Figure 3.

However, hazard functions are affected by a variety of country-specific factors, potentially varying over time. Consequently, it is desirable to control for such factors directly. As such in the next section we conduct the estimation of the proportional hazard model by means of partial likelihood.

4.2 Duration Dependence and Time-varying Covariates

The piecewise constant proportional hazard (PWC) model is constant at each interval, but varies from one interval to the other. This method allows the estimation of fully non-parametric specifications for the baseline hazard, analogously to the Cox model. All intervals are assumed to be of unit length so the recorded duration for each country i corresponds to the interval $[t_i - 1, t_i)$ and countries are recorded as either having left the pegged state during the interval, or as still remaining in the pegged state. This methodology will allows us to observe if the hazard function depends upon previous length of time spent in the pegged state, duration dependence.

The interval-specific baseline hazard in PWC model can only be identified for those intervals during which events occur. If there are duration intervals for which this is not true, then the duration dimension needs to be grouped more or the relevant country-year combinations must be dropped from the estimation. To this effect we look at the number exits from a peg for each year under observation. Table 5 shows that there are no exits from a fixed exchange rate regime during years 1, 11, 25, 27, 32, 36, and 37. As such, a year-specific hazard rate cannot be estimated for these intervals. We also observe that the exit rate from a fixed exchange rate regime is the highest in the early years of the peg. About 27 percent of the exits in our sample occur in the first four years of of the peg, and about 43 percent of the exits occur within the first 10 years. The non-parametric baseline model is then estimated by including all the relevant duration dummies. Due to these proportions we focus our estimates in the behavior of the base-line hazard for the first 10 years since the beginning of the peg.

The results of the PWC model are reported in Table 6. The dependent variable is the probability of leaving a fixed exchange rate regime for a non-fixed exchange rate regime. The baseline hazard rate has been defined through a set of dummy variables, one for each year until the fourth[13]. From the fifth until the tenth year it has been defined with a dummy for every two years. Three more dummies are introduced for the remaining years with bigger intervals[14].

If the sign on the estimated parameters is negative we interpret it as a decline in the probability of exit from a peg based on that variable. On the other hand if the sign on the estimated parameter is positive then that implies that the probability of exit from a peg increases with that variable. So the negative signs and the statistic significance on the time dummy variables associated with year 4, the interval for years 5 and 6, the interval for year 11 to 16, the interval for years 17 to 26, and the interval for year 27 to 38 indicate that a decrease in the probability of exit from a fixed exchange rate regime during those periods. Furthermore we plot the base-line hazard for our estimated semi-parametric function in Figure 3. The base-line hazard function shows a general downward slope. That is, the likelihood of exit into a a floating exchange rate regime declines with the length of time spent under a peg. Therefore, we can clearly state a negative duration dependence.

[13] The first interval, $yr1$, is used as the reference level.

[14] The number of exits per year for years that there is an exit is relatively small. Some additional grouping of duration intervals might therefore be considered desirable. Hence, we redefine the baseline hazard through a more aggregate set of dummy variables, one for each 6 year period.

We also find that *GDP Growth* has a negative effect on the probability of abandoning a peg and it is robustly significant. The negative sign of the estimated parameter indicates that a decline in GDP growth leads to an increase in the probability of ending the spell of fixed exchange rate regime. That is if growth is declining there would be pressure to ease financial policies through currency devaluation to stimulate activity, especially exports. This will increase the probability of exit from a fixed exchange rate regime.

Inflation, measured as an annual percent change in CPI, is expected to have a positive sign implying that high inflation increases the likelihood of exit from a fixed exchange rate regime. In a country with a peg, higher inflation than partner countries results in significant overvaluation of the real exchange rate. This in turn can impact resources allocation, competitiveness, and macroeconomic stability (Kumar et al. 1998), increasing the probability that a peg is abandoned. The estimated coefficients for *Inflation* from the PWC proportional hazard model are positive and non-significant.

As indicators of the health of the foreign sector we have included the variables *Current Account Balance* and *Openness*. Both of these variables are expected to have negative signs. A greater degree of openness to the rest of the world and a stronger current account should correspond to a reduced probability of an exit. We find that *Current Account Balance* has a surprising positive sign on its estimated value. Notwithstanding, our estimated coefficient is not significant.

Openness reflects how connected the economy is to the rest of the world and reflects trade liberalization. The parameter estimation on the variable *Openness* is negative or positive depending on the model specification. However, it is not significant. Hence we do not have support for Milesi-Ferreti and Razin (1998)'s finding that more open economies are less likely to suffer an exchange rate crash.

Claims on Government is included in the model to capture the effect of domestic credit expansion on the likelihood to abandon a fixed exchange rate regime. The variable *Claims on Government* is expected to have a positive estimated parameter because credit expansion due to the monetarization of the government budget deficit increases the likelihood of a speculative attack resulting in the abandonment of a peg. Yet, we find that the estimated coefficient is negative, albeit it non significant. We also directly test for the effect of domestic credit on the probability of abandoning a peg by estimating the model using domestic credit (*Credit*). The estimated parameter has no effect on the probability of abandoning a peg.

The variable *Political Rights* is included as a proxy for the quality of institutions. It is likely that countries with a stronger institutional framework will be able to sustain a fixed exchange rate regime for a longer period of time. We find that the estimate on *Political Rights* is positive and highly significant in model specification (3) indicating that the more democratic institutions a country has the more likely it will maintain a peg. A stronger democratic country means a better quality of institutions. The fact that better quality of institutions tend to reduce the probability of an exit from a peg is not surprising, given that these institutions, including the central banks, have more credibility.

Unemployment is expected to increase the probability of exit from a fixed exchange rate regime. An increase in unemployment reflects the fall in economic activity which increases the vulnerability to currency crisis. Our results indicate that *Unemployment* is not a significant determinant of a switch from a fixed to a flexible exchange rate regime[15].

Real Effective Exchange Rate (REER) is expected to have a positive sign. *REER* can be used as a proxy for the loss of international price competitiveness as well as for exchange rate misalignment. When a country devalues its currency, the trading partners' position deteriorates with regards to that country's economy. A higher

[15]The insignificance of the *Unemployment* variable could be attributed to the fact that the lack of competitiveness is already captured through the variable *GDP Growth*.

value of the exchange rate index implies a more appreciated domestic real exchange rate leading to a less likelihood of abandoning a fixed exchange rate regime in that country Kumar et al. (1998). Our results show that the conditional probability of an exit is not significantly affected by *REER*.

The variable *Reserves*, which measures the level of international reserves (minus gold) held by a country, remains negative and insignificant except in model specification (6). However, this significance is not robust. The negative sign on *Reserves* is expected for a country that has a high level of foreign reserves which can maintain its peg easily. Similar reasoning can be applied for expecting the negative sign associated with *Net Foreign Assets*. In our estimations we find that the direction of the coefficient on *Net Foreign Asset* varies but remains insignificant.

4.3 Intra-country Correlation

As we have shown in Table 4, countries could have multiple exits from a fixed exchange rate regime to a floating exchange rate regime during the period of observation. A major issue in extending proportional hazard regression models to multiple events per subject is the intra-subject correlation which violates the assumption of independent observation in the standard Cox model (Therneau and Grambsch 2000).

The first step to analyzing multiple failure data is deciding whether the failure events are *ordered* or *unordered*. Then we need to decide if the failure events are the same type or of different type. In our case we have ordered failure events, because a country can't experience its second exit from a peg before its first. Moreover, the hazard function is not allowed to vary by failure type because we only have one definition of an exit from a peg.

The two common approaches that are utilized to analyze correlated ordered events are the (Andersen and Gill 1982) model (AG) and the (Wei et al. 1989) model (WLW). Both of these approaches are marginal regression models in that$\hat{\beta}$ is determined from a fit that ignores the correlation between the events followed by a correction of the variance. The results of the AG estimations are presented in Table 7, while the estimated results for the WLW model are found in Table 8.

The results of the AG estimation match those of the piecewise constant (PWC) model with regards to signs, even though magnitudes vary. *GDP Growth* appears to be the only robust significant variable that affects the conditional probability of an exit from a fixed exchange rate regime. Surprisingly, however, we find that *Current Account Balance* carries a significant positive sign. We expect that when the *Current Account Balance* is positive that exports are greater than imports, in which case a country on a peg should continue its peg for currency stability as opposed to abandoning the peg. Hence, this unexpected result could possibly be explained by the limitation of the Andersen-Gill model, where the fact that there are multiple events occurring at a given time is not allowed.

The negative and significant results associated with *GDP Growth* and the positive and significant results found for *Political Rights* are reiterated in the WLW estimations. *Current Account Balance* is also positive and significant in the third specification of the WLW model which is surprising, but the result is not robust. Furthermore, *Reserves*, *Openness*, and *Unemployment* have the expected sign, albeit the coefficients are not significant. The signs on the parameter estimates on *Inflation*, *Current Account Balance*, and *Claims on Government* are not consistent with the predictions of economic theory. Notwithstanding, the coefficients are not significant.

5 Final Remarks

In this paper we employ a duration model approach towards the determination of the choice of exchange rate regime, in particular the conditional probability of exit from a fixed exchange rate regime. To this effect, we use both non-parametric and semi-parametric techniques to estimate hazard functions. The main objective of this study was to test if time spent on a fixed exchange rate regime was a determinant of the probability of exit into a flexible exchange rate regime. The results both from the non-parametric Kaplan-Meier estimator and the semi-parametric piecewise constant proportional hazard model uncover significant duration dependence (with a small but not significant positive dependence at the beginning). It appears that time spent within a regime is itself significant determinant of the probability of exit from a fixed exchange rate regime. This fact may suggest that as the credibility of the peg increases over time the need to abandon a peg decreases.

Furthermore, to the extent that duration dependence may be driven by time-varying covariates, we also estimated a semi-parametric proportional hazard model as well as marginal models. GDP growth appears to be the only variable that robustly affects the conditional probability to abandon a peg. A decrease in GDP growth is associated with an increase in the likelihood of an exit from a fixed exchange rate regime. This result is consistent with the predictions of economic theory in that countries facing a recession would be more likely to abandon a peg in order to stimulate exports and boost output. Other time-varying macroeconomic, financial, and institutional variables don't appear to have a significant effect on the probability of abandoning a peg.

However, the issue of duration dependence deserves further investigation. It is especially imperative to understand the different paths that countries take to move from a fixed exchange rate regimes to non-fixed exchange rate regimes. Some exits have been orderly while other exits have been very disruptive due to the fact that authorities are devaluing without a choice signaling that they have lost control. Moreover, even though a negative GDP growth is a highly significant determinant of the probability to abandon a peg, the recent global financial crisis has shown that some emerging economies are still holding on to their peg despite economic hardship, indicating that there is a gap between economic theory and currency policy implementation which needs to be further explored.

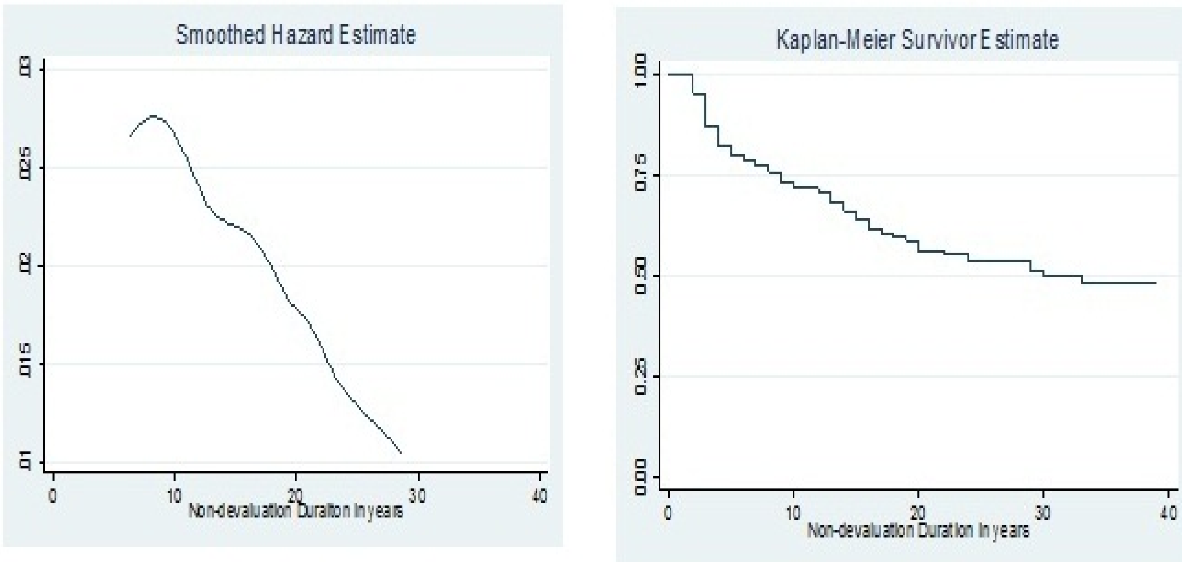

Figure 1: Smoothed Hazard Estimate and Kaplan-Meier Survivor Estimate

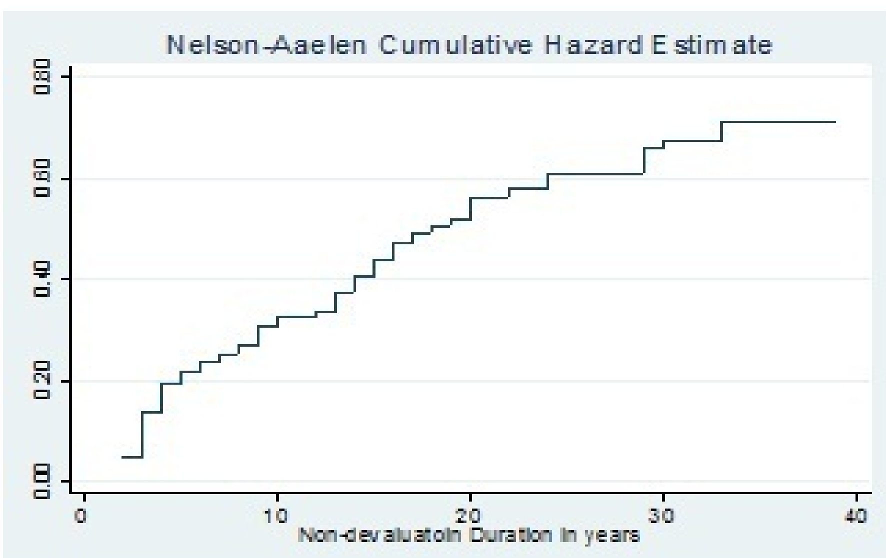

Figure 2: Nelson-Aalen Cumulative Hazard Estimate

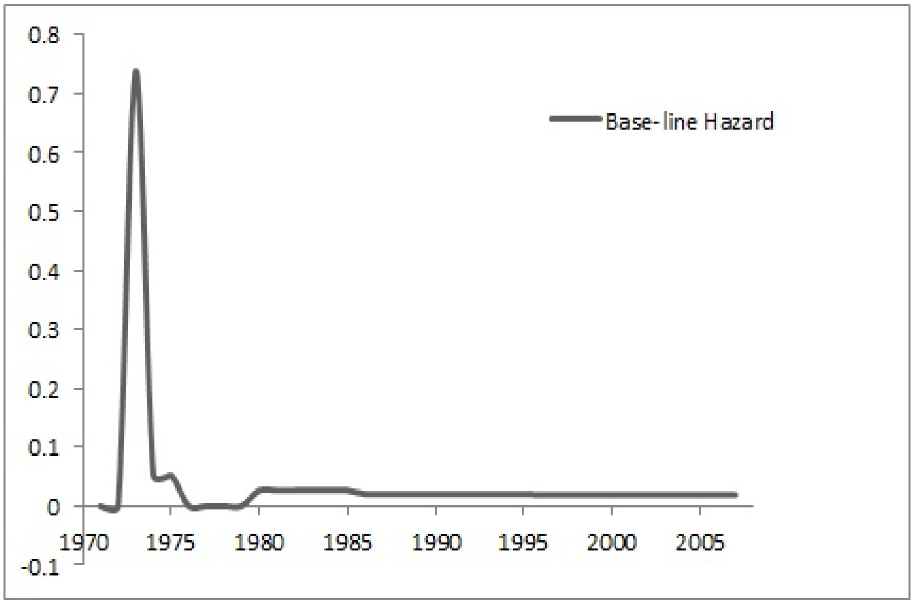

Figure 3: Estimated base-line hazard

Table 1: Expected Signs for Explanatory Variables

Explanatory Variables	Expected Sign
GDP Growth	-
Inflation	+
Openness	-
Current Account Balance	-
REER	+
Unemployment	+
Claims on Government	+
Net Foreign Assets	-
International Reserves	-
Political Rights	-

Table 2: Distribution of Total Peg Spells

T	Frequency	Percent	Cum.
1	76	1.54	1.54
2	192	3.89	5.42
3	149	3.01	8.44
4	152	3.08	11.51
5	93	1.88	13.4
6	197	3.99	17.38
7	114	2.31	19.69
8	164	3.32	23.01
9	104	2.1	25.11
10	76	1.54	26.65
11	110	2.23	28.87
12	110	2.23	31.1
13	198	4.01	35.11
14	145	2.93	38.04
15	148	2.99	41.04
16	38	0.77	41.8
18	295	5.97	47.77
19	115	2.33	50.1
20	190	3.84	53.95
21	76	1.54	55.48
22	152	3.08	58.56
23	76	1.54	60.1
24	76	1.54	61.63
26	114	2.31	63.94
28	38	0.77	64.71
29	38	0.77	65.48
30	110	2.23	67.71
31	76	1.54	69.24
32	114	2.31	71.55
33	38	0.77	72.32
34	76	1.54	73.86
35	76	1.54	75.39
36	38	0.77	76.16
37	38	0.77	76.93
38	1,140	23.07	100
Total	4,942		
Mean	141		
Median	110		
Stadard Deviation	183		
Range	[1,38]		

Table 3: Distribution of Completed Spells

T	Frequency	Percent	Cum.
1	76	2.98	2.98
2	154	6.04	9.02
3	76	2.98	12
4	76	2.98	14.99
5	76	2.98	17.97
6	55	2.16	20.13
7	114	4.47	24.6
8	114	4.47	29.07
9	53	2.08	31.15
10	38	1.49	32.64
11	72	2.82	35.46
12	76	2.98	38.45
13	76	2.98	41.43
14	53	2.08	43.51
15	76	2.98	46.49
18	76	2.98	49.47
19	76	2.98	52.45
20	190	7.45	59.91
21	76	2.98	62.89
22	152	5.96	68.85
23	76	2.98	71.83
24	76	2.98	74.81
26	114	4.47	79.29
28	38	1.49	80.78
29	38	1.49	82.27
30	72	2.82	85.09
31	76	2.98	88.07
32	114	4.47	92.55
33	38	1.49	94.04
34	76	2.98	97.02
35	38	1.49	98.51
37	38	1.49	100
Total	2,549		
Mean	80		
Median	76		
Stadard Deviation	36		
Range	[1,37]		

Table 4: Number of Total Exits from a Peg

No. of Exits	Freq.	Percent	Cum.
0	2,393	48.42	48.42
1	1,635	33.08	81.51
2	724	14.65	96.16
3	114	2.31	98.46
4	76	1.54	100
Total	4,942	100	

Table 5: Exit from a Peg Per Time Period

Year	Period	exitpeg=0	exitpeg=1	Total
1970	1	144	0	144
1971	2	137	7	144
1972	3	132	12	144
1973	4	135	9	144
1974	5	141	3	144
1975	6	142	2	144
1976	7	142	2	144
1977	8	142	2	144
1978	9	139	5	144
1979	10	142	2	144
1980	11	144	0	144
1981	12	141	3	144
1982	13	139	5	144
1983	14	139	5	144
1984	15	141	3	144
1985	16	139	3	142
1986	17	136	4	140
1987	18	124	1	125
1988	19	122	1	123
1989	20	120	3	123
1990	21	120	1	121
1991	22	118	3	121
1992	23	118	3	121
1993	24	117	3	120
1994	25	120	0	120
1995	26	119	1	120
1996	27	120	0	120
1997	28	119	1	120
1998	29	113	7	120
1999	30	118	2	120
2000	31	117	3	120
2001	32	120	0	120
2002	33	115	4	119
2003	34	114	1	115
2004	35	113	1	114
2005	36	114	0	114
2006	37	113	0	113
2007	38	109	1	110
Total	4,839	103	4,942	

Table 6: Piecewise Constant Proportional Hazard Estimations

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
yr2	-17.17	-16.84	-17.66	-16.97	-17.17	-17.15
	(6,342)	(5,756)	(6,075)	(4,791)	(6,351)	(3,502)
yr3	-18.43	-18.08	-18.87	-15.94	-18.42	-16.10
	(2,560)	(2,327)	(2,594)	(2,475)	(2,559)	(1,832)
yr4	-2.405*	-2.282*	-3.085**	0.305	-2.398*	-0.303
	(1.279)	(1.306)	(1.396)	(1.852)	(1.284)	(1.967)
yr5-yr6	-3.166**	-3.070**	-3.577***	-2.170	-3.156**	-2.952
	(1.254)	(1.273)	(1.329)	(1.717)	(1.257)	(1.952)
yr7-yr8	-17.59	-17.25	-17.74	-17.37	-17.59	-17.41
	(1,539)	(1,397)	(1,485)	(1,571)	(1,541)	(1,142)
yr9-yr10	-17.36	-17.06	-17.60	-17.08	-17.36	-16.96
	(1,548)	(1,408)	(1,506)	(1,564)	(1,549)	(1,152)
yr11-yr16	-3.264***	-3.225***	-3.531***	-2.958*	-3.264***	-3.629**
	(0.641)	(0.646)	(0.707)	(1.541)	(0.643)	(1.806)
yr17-yr26	-3.544***	-3.530***	-3.850***	-3.335**	-3.546***	-3.902**
	(0.598)	(0.605)	(0.655)	(1.445)	(0.601)	(1.718)
yr27-yr38	-3.270***	-3.258***	-3.699***	-3.375**	-3.275***	-3.972**
	(0.595)	(0.596)	(0.692)	(1.440)	(0.600)	(1.732)
Inflation	-0.00172	-0.00183	-0.00231	-0.0111	-0.00173	-0.0100
	(0.00294)	(0.00304)	(0.00323)	(0.00837)	(0.00297)	(0.00808)
GDP Growth	-0.217***	-0.215***	-0.246***	-0.218***	-0.216***	-0.225***
	(0.0340)	(0.0345)	(0.0391)	(0.0557)	(0.0340)	(0.0583)
Reserves	-0	-0	-0	-0	-0	-0*
	(0)	(0)	(0)	(0)	(0)	(0)
Openness	-0.00374	-0.00420	-0.00334	0.00264	-0.00369	0.00327
	(0.00555)	(0.00570)	(0.00579)	(0.00598)	(0.00559)	(0.00624)
Current Account Balance	0.0352	0.0426	0.0487	0.0637	0.0355	0.0517
	(0.0295)	(0.0331)	(0.0319)	(0.0414)	(0.0296)	(0.0455)
Claims on Government	-0.00510	-0.00570	-0.00526	-0.00676	-0.00543	-0.00533
	(0.0121)	(0.0123)	(0.0121)	(0.0172)	(0.0122)	(0.0169)
Unemployment	0.0259	0.0228	0.0152	0.0299	0.0266	0.0360
	(0.0300)	(0.0310)	(0.0316)	(0.0352)	(0.0300)	(0.0346)
Net Foreign Asset		-0.00148				0.00651
		(0.00319)				(0.00695)
Political Rights			0.0748*			0.0545
			(0.0404)			(0.0566)
REER				-0.00136		0.00190
				(0.00949)		(0.0102)
Credit					0	
					(0)	
Number of Obs.	1,617	1,617	1,615	1,091	1,617	1,091

Standard errors in parenthesis. ***(**,*) indicates statistical significance at the 1 (5,10) percent level.

We also implemented a PWC proportional hazard model that accounted for unobserved heterogeneity but didn't get any convergence.

Table 7: Andersen-Gill Estimations (Ordered Multiple Exit Data

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Inflation	-0.000544	-0.000490	-0.000554	-0.00809	-0.000524	-0.00631
	(0.00148)	(0.00144)	(0.00146)	(0.00723)	(0.00146)	(0.00656)
GDP Growth	-0.192***	-0.194***	-0.211***	-0.181***	-0.194***	-0.205**
	(0.0313)	(0.0329)	(0.0390)	(0.0644)	(0.0326)	(0.0811)
Reserves	-0	-0	-0	-0	-0	-0*
	(0)	(0)	(0)	(0)	(0)	(0)
Openness	-0.00181	-0.00163	-0.00177	0.00204	-0.00181	0.00434
	(0.00447)	(0.00448)	(0.00488)	(0.00399)	(0.00442)	(0.00481)
Current Account Balance	0.0648**	0.0620**	0.0631**	0.0614	0.0645**	0.0391
	(0.0264)	(0.0276)	(0.0271)	(0.0484)	(0.0264)	(0.0488)
Claims on Government	-0.00557	-0.00548	-0.00655	-0.0149	-0.00551	-0.0143
	(0.00854)	(0.00849)	(0.00847)	(0.0173)	(0.00856)	(0.0172)
Unemployment	0.0428	0.0434	0.0338	0.0394	0.0426	0.0419
	(0.0279)	(0.0281)	(0.0302)	(0.0328)	(0.0281)	(0.0319)
Net Foreign Asset		0.000618				0.00699
		(0.00238)				(0.00493)
Political Rights			0.0591**			0.0670
			(0.0295)			(0.0413)
REER				0.000125		0.00318
				(0.00793)		(0.0106)
Credit					-0	
					(0)	
Number of Obs.	1,585	1,585	1,583	1,076	1,585	1,076

Standard errors in parenthesis. ***(**,*) indicates statistical significance at the 1 (5,10) percent level.

Table 8: Wei,Lin, Weissfeld Estimations (Ordered Multiple Exit Data)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Inflation	-0.000470	-0.000529	-0.000478	-0.00569	-0.000463	-0.00466
	(0.00132)	(0.00136)	(0.00131)	(0.00638)	(0.00131)	(0.00584)
GDP Growth	-0.175***	-0.172***	-0.193***	-0.156**	-0.176***	-0.173**
	(0.0311)	(0.0324)	(0.0376)	(0.0606)	(0.0328)	(0.0731)
Reserves	-0	-0	-0	-0	-0	-0
	(0)	(0)	(0)	(0)	(0)	(0)
Openness	-0.000601	-0.000786	-0.000598	0.00205	-0.000608	0.00373
	(0.00425)	(0.00430)	(0.00471)	(0.00461)	(0.00422)	(0.00520)
Current Account Balance	0.0453	0.0494*	0.0440	0.0385	0.0451	0.0253
	(0.0277)	(0.0286)	(0.0286)	(0.0515)	(0.0278)	(0.0499)
Claims on Government	-0.00706	-0.00717	-0.00806	-0.0216	-0.00705	-0.0202
	(0.00844)	(0.00852)	(0.00840)	(0.0195)	(0.00844)	(0.0186)
Unemployment	0.0390	0.0382	0.0287	0.0413	0.0389	0.0441
	(0.0296)	(0.0301)	(0.0316)	(0.0333)	(0.0299)	(0.0328)
Net Foreign Asset		-0.000861				0.00445
		(0.00257)				(0.00580)
Political Rights			0.0625**			0.0654
			(0.0295)			(0.0418)
REER				-0.00204		0.00142
				(0.00903)		(0.0116)
Credit					-0	
					(0)	
Number of Obs.	1,585	1,585	1,583	1,076	1,585	1,076

Standard errors in parenthesis. ***(**,*) indicates statistical significance at the 1 (5,10) percent level.

Table 9: Exchange Rate Regime Classification, Reinhart and Rogoff (2004)

Regime	Coarse Grid
No Separate legal tender	1
Pre announced peg or currency board arrangement	1
Pre announced horizontal band that is narrower than or equal to + \−2%	1
De facto peg	1
Pre announced crawling peg	2
Pre announced crawling band that is narrower than or equal to +\−2%	2
De facto crawling peg	2
De facto crawling band that is narrower than or equal to +\−2%	2
Pre announced crawling peg that is narrower than or equal to +\−5%	3
Moving band that is narrower than or equal to +\−2% (i.e. allows for both appreciation and depreciation over time)	3
Managed floating	3
Freely floating	4
Freely falling	5
Dual market in which parallel market data is missing	6

Table 10: Variable Definitions and Summary Statistics

Source	Variable	Obs	Mean	Std. Dev.	Min	Max
Reinhart and Rogoff (2004)	RR Classification	4390	2.258	1.310	1.000	6.000
	Peg	4390	0.652	0.476	0.000	1.000
	Exit from a Peg	4242	0.024	0.154	0.000	1.000
WDI, World Bank	Growth (annual %)	4561	3.835	6.474	-51.031	106.280
WDI, World Bank	Inflation (% CPI)	4116	39.314	475.896	-100.000	24411.030
WDI, World Bank	Current Account Balance	3766	-3.012	9.661	-240.496	56.698
WDI, World Bank	Openness	4537	69.870	40.448	0.309	438.092
WDI, World Bank	Claims on Government (% GDP)	4439	10.941	22.851	-86.547	272.697
WDI, World Bank	REER	2068	3747.840	132249.600	26.821	5965760.000
WDI, World Bank	Reserves (minus gold)	4575	$9.90e^{9}$	$4.85e^{10}$	-628535.5	$1.53e^{12}$
Lane and Milesi-Ferreti(2007)	Net Foreign Asset	4643	-8377.156	137769.500	-2359118.000	2180352.000
WDI, World Bank	Employment (%)	1707	99.016	3.952	43.500	102.500
WDI, World Bank	Unemployment (%)	1796	8.896	5.789	0.154	39.285
WDI, World Bank	Credit (domestic)	4576	$1.41e^{13}$	$1.06e^{14}$	$-1.34e^{12}$	$1.60e^{15}$
Polity IV Project	Political Rights	4902	0.858	7.470	-10.000	10.000

References

Andersen, P. and R. Gill (1982). Cox's regression model for counting processes. *Annuals of Statistics 10*, 1100–1120.

Bubula, A. and I. Otker-Robe (2002). The evolution of exchange rate regimes since 1990: Evidence from defacto policies. IMF Working Paper155.

Calvo, G. and C. Reinhart (2002). Fear of floating. *Quarterly Journal of Economics 107*(2), 379–408.

Carmignania, F., E. Colombob, and P. Tirellib (2008). Exploring different views of exchange rate regime choice. *Journal of International Money and Finance 27*(7), 1177–1197.

Cleves, M. (2002). How do i analyze multiple failure-time data using stata? Stata FAQ, (http://www.stata.com/support/faqs/stat/stmfail.html).

Cox, D. (1972). Regression models and life tables. *Journal of Royal Statistical Society 34*, 187–220.

Duttagupta, R. and I. Otker-Robe (2003). Exits from pegged regimes: An empirical analysis. IMF Working Paper 147.

Eichengreen, B., A. Rose, and C. Wyplosz (1995). Exchange market mayhem: The antecedent and aftermath of speculative attacks. *Economic Policy 21*, 249–312.

Fischer, S. (2001). Distinguished lecture on economics in government: Exchange rate regimes: Is the bipolar view correct? *Journal of Economic Perspectives 15*(2), 3–24.

Frankel, J. (1999). No single currency regime is right for all countries or at all times. NBER Working Paper 7338.

Ghosh, A., A. Gulde, and H. Wolf (2002). *Exchange Rate Regimes Choices and Consequences*. MIT PRess.

Johnson, C., M. Boyce, C. Schwartz, and M. Haroldson (2004). Modeling survival: Application of the andersen-gill model to yellowstone grizzly bears. *Journal of Wildlife Management 68*(4), 966–978.

Juhn, G. and P. Mauro (2002). Long-run determinants of exchange rate regimes: A simple sensitivity analysis. IMF Working Paper, 02/104.

Klein, M. and N. Marion (1994). Explaining the duration of exchange rate pegs. NBER Working Paper Series, working paper 4651.

Kumar, M., U. Moorthy, and W. Perraudin (1998). Financial crises: Contagion and market volatility. A CEPR/World Bank Conference, Mimeo.

Levy-Yeyati, E. and F. Struzenegger (2002). Classifying exchange rate regimes: Deeds vs. words. Universidad Torcuato Di Tella, manuscript.

Lipsitz, S., N. Laird, and D. Harrington (1990). Using the jackknife to estimate the variance of regression estimators from repeated measures studies, communication in statistics. *Theory and Methods 19*, 821–845.

Masson, P. and F. J. Ruge-Murcia (2003). Explaining the transition between exchange rate regimes. CIREQ Working Paper 15.

McKinnon, R. (1963). Optimum currency areas. *American Economic Review 53*(4), 717–725.

Metcalfe, C. and S. Thompson (2007). Wei, lin and weissfeld's marginal analysis of multivariate failure time data. *Statistical Methods in Medical Research 16*, 103–122.

Milesi-Ferreti, G. and A. Razin (1998). Current account sustainability. Washington: Institute for International Economics, Mimeo.

Mundell, R. (1961). A theory of optimal currency areas. *American Economic Review 51*, 509–517.

Obstfeld, M. and K. Rogoff (1995). The mirage of fixed exchange rates. *Journal of Economic Perspectives 9*(4), 73–96.

Poirson, H. (2001). How do countries choose their exchange rate regime? IMF Working Papers, 01/46.

Reinhart, C. and K. Rogoff (2004). The modern history of exchange rate arrangements. *Quarterly Journal of Economics 119*(1), 1–48.

Rizzo, J. (1998). The economic determinant of the choice of an exchange rate regime: A probit analysis. *Economics Letters 59*(3), 283–287.

Setzer, R. (2004). The political economy of exchange rate regime duration: A survival analysis. University of Hohenheim, manuscript.

Shambaugh, J. (2004). The effect of fixed exchange rates on monetary policy. *The Quarterly Journal of Economics 119*(1), 301–352.

Therneau, T. and P. Grambsch (2000). *Modeling Survival Data: Extending the Cox Model*. Springer, New York.

Tudela, M. (2004). Explaining currency crisis: A duration model approach. *Journal of International Money and Finance 23*, 799–816.

VonHagen, J. and J. Zhou (2007). The choice of exchange rate regimes in developing countries: A multinomial panel analysis. *Journal of International Money and Finance 26*, 1017–1094.

Walti, S. (2005). The duration of fixed exchange rate regimes. Trinity College, Mimeo.

Wei, L., D. Lin, and L. Weissfeld (1989). Regression analysis of multivariate incomplete failure time data by modeling marginal distributions. *Journal of the American Statistical Association 84*, 1065–1073.