Journal of Applied Economics and Business Research
JAEBR, 4(4): 263-279 (2014)

Monetary Factors in Recurring Economic Recessions

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Abstract

This paper used parametric shared-frailty models to observe the recession periods of 22 countries. The constant increases in the values of change in consumer prices, foreign exchange reserves (FERs), ratio of foreign direct investment to gross domestic product (GDP), ratio of domestic credits to GDP, and ratio of monetary base to FERs were found to shorten the recession periods of economies. On the other hand, a steady increase in real effective exchange rates, economic openness, and lending-to-deposit ratio can lead to longer recessions. Moreover, economies were found to diverge after currency crises, whereas no apparent differences in economies were observed before crises; and this is attributed to some economies access to financing opportunities, whereas others have lesser and even faced enforceability problems.

Jel code: C33, F30, F40

Key words: *Monetary variables, Recurring recessions, Parametric shared-frailty models*

1. Introduction

Governments aim to shorten economic recessions through stimulating expansionary monetary policy that encourages consumer spending, business lending and investment. Monetary policy adjustments help reduce the negative impacts of business cycle contractions by normally lowering interest rates, and expanding the money supply. Studies on monetary policies and recessions have already received much attention in the literature because of the importance of identifying possible interventions in shortening the duration of economic downturns and determining factors that minimizes the negative effects of recessions. Studies on duration dependence (Sichel 1991; Kim and Nelson, 1999; Zuehlke, 2003; Perruchoud, 2008) indicate that the longer a recession lasts, the more it is likely to end. However, economists and academicians don't just rely on the time factor to see the receding effects of downturns. Most studies have considered making adjustment on macroeconomic variables, such as unemployment and inflation

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rates (Palley, 2000; Knotek and Terry, 2009), and monetary variables, such as banking and currency factors (Altintas and Oz, 2007; Ahmed, 2009) to minimize the effects of recessions. Despite the rich literature on survival and hazard models in business and finance (Sichel, 1991; Pazarbasioğlu and Otker, 1997; Tudela, 2004; Chen, 2010), empirical studies using parametric shared-frailty models for understanding business cycles particularly during recession recurrences are very limited if not totally missing in the literature. For some particular examples, Nalewaik (2006) applied Markov switching models related to the gross domestic product (GDP) to recognize recessions. Davig (2007) used the change-point model to identify structural shifts in the time series of durations for expansions and contractions. These proves that only a few studies have discussed the factors that affect the exit timing of recession recurrences, as well as those that have expounded on business cycles.

Previous papers have contributed to a better understanding of economic contractions, discussing topics such as the stages of recession (Hetzel, 2009) and country-specific (Cordero, 2009) and region-wide (Quispe-Agnoli, 2001) recessions. This research performs a comprehensive study on recession recurrences examining three decades of data, from the 1980s up to the 2000s covering 22 countries. The duration of recession in each country is hypothesized to be dependent on the effects of four macroeconomic factors, such as economic openness (EO), changes in consumer prices (CCPs), real effective exchange rate (REER), and ratio of foreign debt (FD) to exports (Ex). It is also assumed to be dependent on six monetary variables, such as the discount rate (DR), lending-to-deposit ratio (L/D), ratio of domestic credits (DCs) to GDP, FERs, ratio of foreign direct investment (FDI) to GDP, and ratio of monetary base (M0) to FER. This paper has three major specific objectives:

1) investigates if macroeconomic and monetary factors have significant effects on the duration of recurring recessions;

2) examines significant changes in the recession recurrences before and after the regional waves of currency financial crises; and

3) analyzes the effects of three vulnerabilities, such as the Exchange Rate Mechanism (ERM) Crisis of 1992, the Mexican Tequila Crisis of 1994, and the Asian Financial Crisis of 1997, all of which greatly affected the regional economy.

This research contributes to the macroeconomic and monetary policies and business cycles, particularly with regard to periods of recessions, by bridging the gaps of previous studies and applying relatively new models to examine the exit time of recession recurrence. This research will not only aid academicians in their future studies but, hopefully, will also help policy makers in controlling relevant factors as they design economic and monetary policies, particularly in times of economic contractions.

This study is organized as follows: Section II narrates literature review, Section III describes the data and explains the hypotheses, Section IV presents the parametric shared-frailty models, Section V interprets the results, and Section VI provides the conclusions.

2. Literature Review

This section gives an overview of related studies that already proved the existence of relations of the four macroeconomic factors and six monetary variables. The literature also explains how these two sets of independent variables lengthen or shorten the exit times of economies during downturns.

2.1 Macroeconomic factors

Research studies among developing countries (Gundlach, 1997) and European nations (Ngozo, 2006; Capolupo and Cheli, 2008) discovered mixed results on the benefits and harmful effects of *EO*[1] on economic growth. Past studies indicated that some countries gain from trade liberalization, whereas others do not. However, literature agrees that a higher degree of EO implies a greater probability of economic growth that helps in minimizing the effects of recession. Inflation, on the other hand, weakens purchasing power and discourages savings and investments. According to Gonzales-Hermosillo et al. (1997), unexpected inflation related to predicaments of recession has negative effects on the banking sector. While Palley (2000) concluded that a low inflation rate has beneficial effects on financial markets, lowering the chances of economic downturns. This result is consistent with the mainstream idea that favors a low steady inflation rate that can reduce the severity of recessions.

Regarding the effects of exchange rate, Dabrowski (2002) discovered that continually increasing values of *REER*[2] signify a currency crisis because of the devaluation of trade balance, and balance of payment disequilibrium. This result has been supported by Edison (2003), stating that overvaluations of REER are normally related with currency crises and a weakening economic system. Furthermore, Yang and Tyers (1999) and Ragacs and Vondra (2009) both agree that, during recessions, slumps in both export and investments exist. Kaminsky (2005) highlighted that a weakening economy can be caused by a high foreign debt coupled with high world interest rates.

2.2 Monetary variables

Studies of Edison (2003) and Martellato (2009) on interest rates found that before and during a crisis, an economy experiences a rising and volatile real interest rate. An economic crisis is a consequence of deposit drain and an increasing volume of overdue and nonperforming loans (Chen and Wang, 2008). As concluded by Berg and Pattillo (1999), high loan growth rates are associated with higher crisis probabilities. Beaton (2009) studied the effect of domestic credits, which measure the availability of capital to the local borrowing population; and concluded that consumer spending increases as a positive response to the growing numbers of credit opportunities.

Based on the studies of Sachs et al. (1996), Kaminsky et al. (1998), and Altintas and Oz (2007), economies with less foreign exchange reserves and high domestic credit growth may be more prone to a currency crisis. In a related study, Klau and Hawkins (2000) stated that excess credit growth and insufficient international reserves during recessions precede financial crises. Makin et al. (2008) studied the effects of FDIs, and discovered that the increasing foreign capital inflow plays a positive role in the development of an economy. Lastly, sustained money creation, according to Hetzel (2009), can stimulate the spending of the public that brings back confidence in the economic revival. Highlighting the importance of the role of money stimulates the economy.

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[1] EO can be obtained by dividing the sum of EX and imports by the GDP as applied in the studies of Guttman and Richards (2004), and Ghosh and Li (2007).

[2] REER is calculated by subtracting the nominal exchange rate from the ratio of domestic and foreign price levels.

3. Data and Hypothesis

Country statistics are presented on a quarterly basis and cover three decades of panel data from the 1980s until the 2000s with 22 countries as study samples. The lengths of the recession were derived from the Organization for Economic Cooperation and Development business cycle analysis database, under the Country Component Series and Reference Turning Point sections. The number of months that an economy stayed from peak to trough was calculated. The macroeconomic and monetary variables were obtained from the International Financial Statistics database, published by the International Monetary Fund (IMF).

The relationships of independent variables to the exit time of a country under recession recurrences in relation to macroeconomic and monetary factors are summarized in Table 1. These hypotheses are based on the discussions presented in the literature review.

Table 1: Notation and Definition of the Variables Used

Category	Variables	Notation	Sign
	Economic openness	EO	–
Macroeconomic	Changes in consumer prices	CCP	+
Factors	Real effective exchange rate	REER	+
	Foreign debt to exports ratio	FD/EX	+
	Discount rate	DR	+
Monetary	Lending to deposit ratio	L/D	+
Variables	Domestic credits to GDP ratio	DC/GDP	–
	Foreign exchange reserves	FER	–
	Foreign direct investment to GDP ratio	FDI/GDP	–
	Monetary base (M0) to FER ratio	M0/FER	–

Note: Due to data limitations, some countries' discount rate, M0, real effective exchange rate and foreign debt are replaced with related variables.

3.1 Macroeconomic factors hypotheses

(1) EO is said to be negatively related with length of recessions, because a greater probability of trade liberalization brings economic growth to the receiving economy (Capolupo and Cheli, 2008).

(2) CCP is considered to be positively related with the duration of recessions because rapid upward changes in the inflation limit purchasing power and dampen investments (Palley, 2000). Thus, a sudden and continued increase in *CCPs* can extend the probability of exit time of recession recurrences.

(3) REER is also positively related with length of recessions because rising exchange rates

causes the devaluation of trade balance, and creates disequilibrium in the balance of payment (Dabrowski, 2002; Edison, 2003). Therefore, large deviations of REER are anticipated to prolong economic contractions, resulting in longer exit times.

(4) Ratio of FD/EX is negatively related with length of recessions, because higher number of FD makes a country more difficult to service debt in times of economic downturns (Yang and Tyers1999; Kaminsky, 2005). Hence, a high ratio of foreign debt to export has a negative impact on economic growth, causing the likelihood of a longer exit time during recessions.

3.2 Monetary variables hypotheses

(1) DR is considered to be positively related with length of recessions, because unstable interest rates also discourage savings and investments (Martellato, 2009). Therefore, a steady increase in DR results in a sluggish recovery and may result in a continued recession with longer exit times.

(2) Ratio of L/D is said to be also positively related with the duration of recessions because crises are characterized by increasing volume of overdue and nonperforming loans (Chen and Wang, 2008; Berg and Pattillo, 1999). Thus, increasing the L/D ratio is expected to weaken the economy, resulting to a longer exit time in recession periods.

(3) Ratio of DC/GDP is negatively related with length of recessions because the increase in the number of credit opportunities leads to the increase in consumer spending and investments (Beaton, 2009). Hence, credit availability increases the *DC/GDP ratio* and can potentially stimulate the economy leading to shorter exit times in an economic downturn.

(4) FER is also negatively related with duration of recessions, because high FER makes a country more flexible in formulating monetary policy adjustments that may lessen the impact of economic downturns (Klau and Hawkins, 2000). Therefore, decreasing *FERs* may result in lower economic growth potential and greater economic fragility, which is likely to extend exit periods in recurring economic recessions.

(5) Ratio of FDI/GDP is said to be also negatively related with length of recessions, because foreign investments in a country creates more income and obtains technical transfer for a country that can be used to stimulate the economy (Makin et al., 2008). Thus, an increasing FDI/GDP ratio can facilitate faster recovery time of a country from a recession resulting in a shorter exit time.

(6) Ratio of M0/FER is considered to be negatively related with the duration of recessions because consistent supply of money can stimulate spending and investment of the public that helps in the revival of the economy (Hetzel, 2009). Hence, a higher M0/FER ratio leads to a greater chance of a country rapidly recovering from downturns resulting in shorter exit periods.

4. Parametric Shared-frailty Models

A shared-frailty model, as discussed by Gutierrez (2001), is a random-effect model, where the frailties are similar (or shared) among groups of subjects or spells and are arbitrarily

distributed across groups. This research applies shared-frailty regression specifications to the recession experiences of the 22 countries studied.

The shared-frailty models, as proposed by Clayton (1978) and Hougaard (2000), are utilized to address matters such as (a) the length of the recession of a certain country and (b) the extent and kind of covariates that prevent the recession from recurring. The standardized shared-frailty model analyzes a panel of survival data using random-effect models and is connected particularly to the exit times of repeated estimates.

The shared frailties across countries are assumed to be correlated for observations within the same group. The hazard function is the conditional probability that a cycle phase ends at a specific duration, given that it has achieved such duration. The hazard is expressed as

$$h\left(t_{ij} \mid x_{ij}, \alpha_i\right) = \alpha_i h\left(t_{ij} \mid x_{ij}\right) \quad (1)$$

where α_i is a frailty that is preset to have a mean of one and a variance θ corresponding to some unobserved observation-specific effect, x_{ij} is the covariate for the observation ($j = 1,\ldots..,n_i$) within a group across different countries ($i = 1,\ldots,G$) at time t, and $\alpha_i < 1$ or $\alpha_i > 1$ is the decrease or increase in the hazard when the subjects experience a decreased or increased risk, respectively (Cleves et al., 2004).

Hazard and survivor functions can be written as

$$S\left(t_{ij} \mid x_{ij}, \alpha_i\right) = \left\{S\left(t_{ij} \mid x_{ij}\right)\right\}^{\alpha_i} \quad (2)$$

where $S\left(t_{ij} \mid x_{ij}\right)$ represents the survival function related to a standard parametric model.

The transformed hazard function is determined by the accelerated failure-time metric, which is expressed as $\ln t_{ij} = \sigma_{ij} w_{ij} + \beta_x x_{ij}$, where $\lambda = e^{-\beta_x}$ is a positive hazard rate parameter and $p = 1/\sigma_{ij}$ indicates a positive scale parameter. β_x denotes the parameters.

Table 2 shows the use of five parametric log-linear survival distributions: Weibull, Exponential, Gompertz, log-normal, and log-logistics (Greene, 2002). The approach for determining the basis for the distribution of the parametric survival functions with (t_{0ij}, t_{ij}) follows the probability procedure of the shared-frailty model:

$$L\left(t_{ij} \mid t_{0ij}, \alpha_i\right) = \left\{\frac{S\left(t_{ij} \mid x_{ij}\right)}{S\left(t_{0ij} \mid x_{ij}\right)}\right\}^{\alpha_i} \left\{\alpha_i h\left(t_{ij} \mid x_{ij}\right)\right\}^{c_{ij}}. \quad (3)$$

Table 2. The Distribution of Survival Function and Hazard Function

Distribution	Survival Function $S(t_{ij} \mid x_{ij})$	Hazard Function $h(t_{ij} \mid x_{ij})$	Shape
Weibull	$\exp\left(-(\lambda t_{ij})^{p}\right)$	$\lambda p(\lambda t_{ij})^{p-1}$	Monotonic hazard rate
Exponential	$\exp(-\lambda t_{ij})$	λ	Monotonic hazard rate
Gompertz	$\exp\left((-p/\lambda)(e^{\lambda t}-1)\right)$	$p\exp(\lambda t)$	Monotonic hazard rate (exponential increase or decrease)
Log-Normal	$\Phi(-p\cdot\log(\lambda t_{ij}))$	ϕ/Φ	Non-monotonic hazard rate
Log-Logistic	$1/\left(1+(\lambda t_{ij})^{p}\right)$	$\lambda p(\lambda t_{ij})^{p-1}/\left(1+(\lambda t_{ij})^{p}\right)$	Non-monotonic hazard rate

Note: Φ represents the standard normal cumulative distribution.
Table is based on the paper of Chen (2010) with an addition of the Gompertz model.

Incorporating the frailty α_i for the ith group (G_i), we express the possibility of the unconditional shared-frailty model as follows:

$$L(G_i)=\int_0^{\infty}\alpha_i^{c_i}\prod_{j=1}^{n_i}\left[\left\{\frac{S(t_{ij}\mid x_{ij})}{S(t_{0ij}\mid x_{ij})}\right\}^{\alpha_i}\left\{h(t_{ij}\mid x_{ij})\right\}^{c_{ij}}\right]g(\alpha_i)d\alpha_i \qquad (4)$$

where $C_i=\sum_{j=1}^{n_i}c_{ij}$ is the incidence of recession across countries (Gutierrez, 2001).

The unconditional survival function is given by

$$S_{\theta}(t_{ij}\mid x_{ij})=\int_0^{\infty}\left\{S(t_{ij}\mid x_{ij})\right\}^{\alpha_i}\cdot g(\alpha_i)d\alpha_i \qquad (5)$$

where θ is the frailty variance used to gauge the degree of heterogeneity among the observed countries and $g(\alpha_i)$ is the probability density function chosen largely for computational convenience after a gamma distribution (Cleves et al., 2004). Then, the survival function with a gamma distribution is

$$g(\alpha_i)=\frac{\alpha_i^{1/\theta-1}\cdot e^{-1/\theta}}{\Gamma(1/\theta)\cdot\theta^{1/\theta}} \qquad (6)$$

where Γ stands for the gamma function.

5. Results and Discussions

The research initially identifies the best fitting probability distribution for the whole

recession data set and for each wave of currency crises. According to Cleves et al. (2004), the best fitting distributions have the largest log pseudo-likelihood, which determines the possibility of recession duration. Figure 1 shows that the log-normal distribution is found to be the optimal distribution in fitting the data for most iterations, followed by the Weibull and Gompertz distributions. The study used the three different regional waves of currency crises during the 1990s, namely, the ERM Crisis, the Mexican Tequila Crisis, and the Asian Financial Crisis, to compare the changes in the exit paces of different economies before and after the crises. The research observed that no significant difference in the countries happened before the crises, but an interesting divergence among economies with longer exit times was found after the crises. This means that different countries have or are experiencing asymmetry in financing opportunities after crises, which is consistent with the findings of Schneider and Tornell (2004). This entails some countries have more access to external financing, whereas other economies have relatively little access to funds; while some countries even have enforceability problems, being immobilized by restriction, which further limits the flexibility in the road to recovery. Table 3 presents the summary of the results and the major findings of this study.

5.1 Findings on Macroeconomic factors

Trade liberalization (EO) was found to have an affirmative result before the ERM crisis in specification II. Trade liberalization leads to shorter exit times or makes an economy more likely to recover from recessions. However, the findings in all recession periods in specification I, after the Mexico Tequila crisis in specification V, and after the Asian Financial Crisis in specification VII show that a higher degree of EO may not be favorable and may lead countries to experience longer downturns. The findings of EO are not perfectly consistent with our initial hypotheses, but conform with the mixed results from the studies of Gundlach (1997) regarding developing countries and of Ngozo (2006) and Capolupo and Cheli (2008) concerning European nations. They posited that some countries benefit from trade liberalization, whereas others do not. The results suggested that government economist and policy-makers should exercise control on the degree of liberalization, especially for developing countries. Over-dependent on foreign capital and direct investments may cripple economy towards recovery because of capital flight. The study also found negative signs of CCP for most specifications, particularly before the Mexico Tequila crisis in specification IV. The results surpassed the expectation of this study, that is, a constant increase in the inflation rate would weaken the economy, thus resulting in longer exit times (Gonzales-Hermosillo et al. 1997 and Palley, 2000). However, creating inflationary expectations by expanding the money supply can cause savers to spend again and stimulate the economy and shorten exit times. Svensson (2004) explained that this possibility is one cure to the liquidity trap experienced during recession, where people still continue to save or pay debts despite having very low or near-zero interest rates.

The expected positive REER is evident in all recession periods (I) and after the ERM crisis in specification III, indicating that constantly increasing REERs extend economic recessions. However, after the Asian Financial Crisis (VII), REER appreciation shortens exit times. These findings correspond with those of Bigio and Salas (2006), who found that depreciations of the real exchange rate, particularly in the case of Peru, have significant negative effects during recession. Furthermore, The FD/EX ratio before the Asian Financial Crisis in specification VI coincides with our hypothesis. Yang and Tyers (1999) and Ragacs and Vondra (2009) explain that during recessions, both EX and investments drop. However, before the ERM (II) and Mexico Tequila (IV) crises, the FD/EX ratio played a positive role in shortening exit times. Foreign loan assistance in the form of the numerator FD plays a vital function in reviving the economy, which is in agreement with the conclusions of Ghartey (2009) in the recovery of

Mexico from their currency crisis because of external financing.

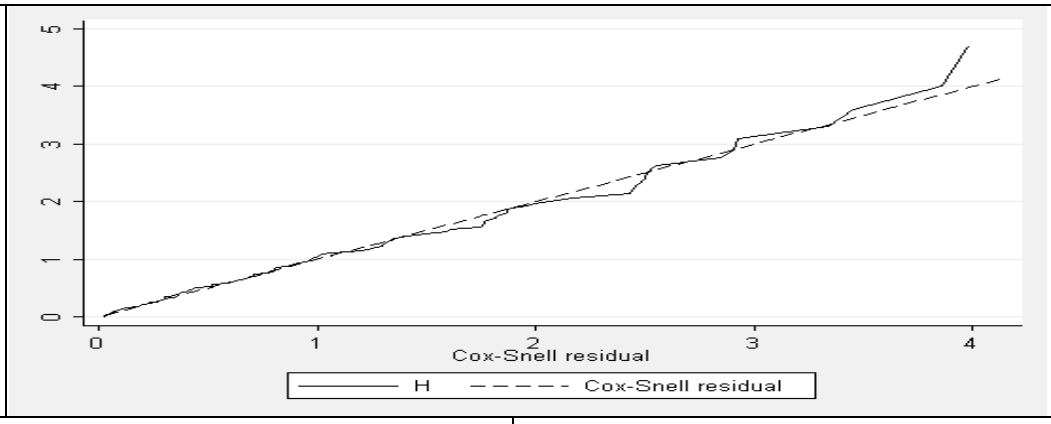
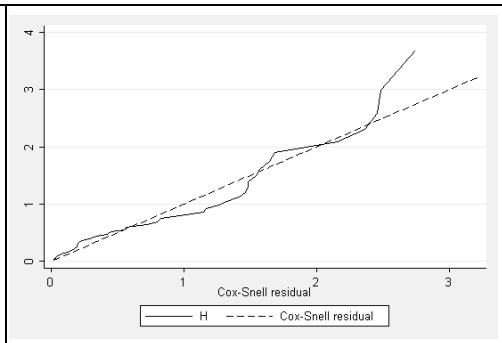
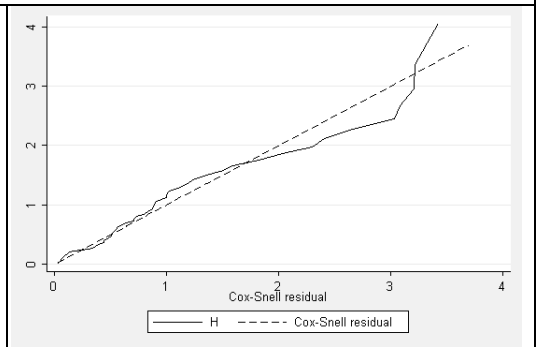
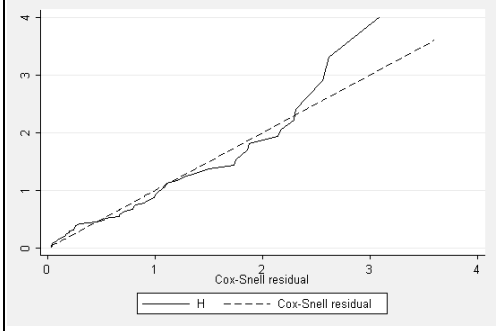
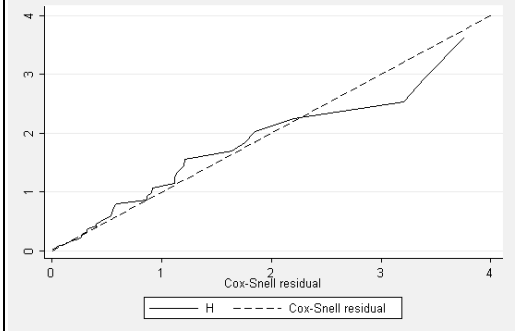
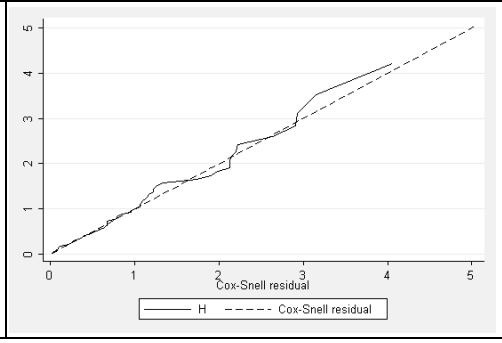
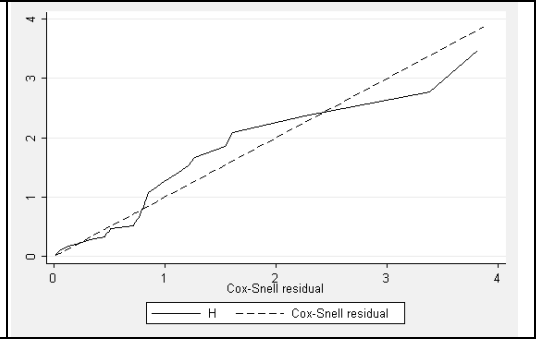
Recession Periods (1980 – 2008)	(a)			
		Before Crisis		**After Crisis**
The ERM Crisis (1992/2)	(b)		(e)	
The Mexico Tequila Crisis (1994/12)	(c)		(f)	
The Asian Financial Crisis (1997/7)	(d)		(g)	

Figure 1. Survival Analysis by period specified

Note: "Crisis = 1" stands for the ERM Crisis; "Crisis = 2" stands for the Mexico Tequila Crisis; and "Crisis = 3" stands for the Asian Financial Crisis.

Table 3: Parametric shared-frailty models for the likelihood of exit time of economic recession occurrence

Variables	Notation	All Recession Periods	ERM Crisis		Mexico Tequila Crisis		Asian Financial Crisis	
			Before	After	Before	After	Before	After
		I	II	III	IV	V	VI	VII
Economic openness	EO	**0.001 (0.011)****	**-0.001 (0.057)***	-0.001 (0.120)	-0.000 (0.747)	**0.002 (0.014)*****	0.001 (0.191)	**0.002 (0.013)****
Changes in consumer prices	CCP	**-0.003 (0.000)*****	-0.040 (0.385)	**-0.003 (0.000)*****	**-0.065 (0.003)*****	-0.006 (0.965)	**-0.002 (0.005)*****	-0.055 (0.179)
Real effective exchange rate	REER	**0.001 (0.001)*****	-0.012 (0.130)	**0.001 (0.000)*****	-0.006 (0.242)	-0.004 (0.486)	0.001 (0.901)	**-0.005 (0.028)****
Foreign debt to exports ratio	FD/Ex	0.010 (0.828)	**-2.296 (0.000)*****	-0.017 (0.739)	**-1.064 (0.000)*****	0.231 (0.844)	**0.384 (0.003)*****	0.188 (0.178)
Discount rate	DR	0.003 (0.407)	0.108 (0.138)	0.007 (0.183)	**0.065 (0.001)*****	-0.043 (0.867)	-0.001 (0.815)	0.026 (0.524)
Lending to deposit ratio	L/D	**0.007 (0.009)*****	-0.053 (0.251)	0.007 (0.160)	**-0.032 (0.062)***	-0.121 (0.455)	0.005 (0.725)	-0.079 (0.170)
Domestic credits to GDP ratio	DC/GDP	**-0.001 (0.007)*****	**0.003 (0.000)*****	-0.001 (0.531)	**0.003 (0.000)*****	**0.010 (0.023)****	**-0.001 (0.008)*****	-0.004 (0.110)
Foreign exchange reserves	FER	**-0.001 (0.000)*****	**-0.001 (0.028)****	0.001 (0.781)	-0.001 (0.152)	**-0.001 (0.022)****	-0.001 (0.980)	-0.001 (0.279)
Foreign direct investment to GDP ratio	FDI/GDP	**-0.001 (0.000)*****	**-0.837 (0.000)*****	**0.001 (0.041)****	-0.001 (0.658)	**-8.184 (0.021)****	-0.001 (0.126)	**-1.491 (0.085)***
Monetary base (M0) to FER ratio	M0/FER	**-0.001 (0.000)*****	**0.003 (0.081)***	**-0.001 (0.000)*****	-0.001 (0.954)	0.001 (0.134)	0.001 (0.861)	**0.001 (0.013)****
Constant		**3.046 (0.000)*****	**-12.191 (0.000)*****	**2.882 (0.000)*****	**-10.249 (0.000)*****	**-8.451 (0.000)*****	**3.028 (0.000)*****	**-11.653 (0.003)*****
Log Pseudo Likelihood		-62.233	-7.573	-33.635	-22.082	-15.207	-34.797	-14.502
Best fitting model		Lognormal	Weibull	Lognormal	Weibull	Gompertz	Lognormal	Weibull

5.2 Findings on Monetary Variables

The significant result for the DR factor before the Mexico Tequila Crisis (IV) is consistent with the study's initial hypothesis and proves that low DR values have a positive effect or hasten the recovery of economy from recession. This finding complements the evidence provided by Edison (2003) and Martellato (2009) stating that high interest rates lead in a sluggish recovery. With regards to the L/D ratio variable, the result met the expectations of this study and with that of the initial findings of Beaton (2009) especially for all recession period (I) samples. The findings indicated that the growing number of credit availability increases the L/D ratio and stimulates the economy, resulting in shorter periods of economic downturn. However, before the Mexico Tequila Crisis (IV), high loan growth rates were associated with higher crisis probabilities (Berg and Pattillo, 1999) resulting to higher default rates, and lengthened recession in affected economies.

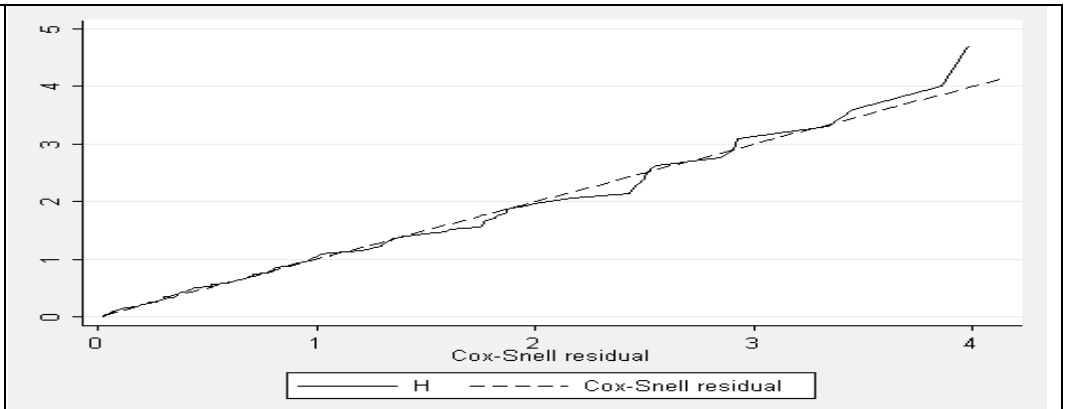
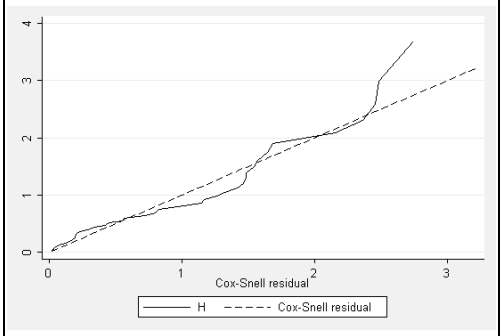
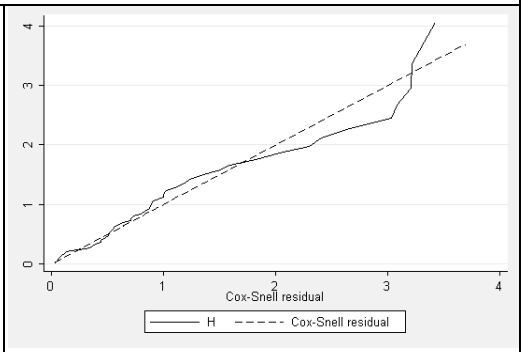
The DC/GDP ratio shows that the growing number of credit availability stimulates the economy (Beaton, 2009). This result is true for all recession periods (I) and before the Asian Financial Crisis (VI). It is also consistent with the hypothesis of the study. However, Chen and Wang (2008) also argue that an economic crisis is sometimes a result of the deposit drain and the increasing volume of overdue and nonperforming loans, which supports the inconsistent positive signs before the ERM (II) crisis and before and after the Mexico Tequila Crisis in IV and V. On one hand, economies with lesser FERs may increase the likelihood of a currency crisis, and may extend recessions. This is based with the results for all recession periods (I), before ERM (II) crisis, and after the Mexico Tequila Crisis (V). This finding is consistent with the hypothesis of this study and with the results of Sachs et al. (1996), Kaminsky et al. (1998), Klau and Hawkins (2000), and Altintas and Oz (2007).

Majority of the findings for the FDI/GDP conform to the expectations of this study. All point to the advantages of having a high FDI/GDP ratio during recession. Makin et al. (2008) explained that an increase in foreign capital inflow is beneficial for the development of an economy, thus making economies recover faster from recessions. Moreover, as explained by Ghartey (2009), Mexico recovered quickly from their peso crisis because of external assistance. The only inconsistent result is that of the case after the ERM crisis (II). According to the studies of Sachs (1981) and Baxter and Crucini (1993), this relation can be attributed to the mobility of international capital, making investment movement the temporary dominant influence and thus resulting in unsustainable growth opportunities and capital flight.

The findings for the M0/FER ratio showed that this variable has both a positive and negative relation to the exit times of recession periods. The samples for all recession periods (I) and after the ERM crisis (III) conform to the expectations of this study. Hetzel (2009) stated that sustained money creation can stimulate the spending of the public, bringing back confidence to the economy's recovery. The assessments taken before ERM (II) and after the Asian Financial (VII) crises both found contrasting results, implying that a low M0/FER ratio can also be beneficial to economic downturns. The low ratio can also mean a higher value of FER, which, according to the findings of Sachs et al. (1996), Kaminsky et al. (1998), and Altintas and Oz (2007), can lead to shorter exit phases during recession.

Figure 2 illustrates the comparison of the prediction accuracies of the models using the Cox–Snell residual method (Cox and Snell, 1968; Hosmer et al., 2008). An accurately fitted model is represented by a straight line having an exponential distribution equal to 1. Based on the results, the Cox–Snell residual method provided a close fit for all the recession period samples. For the

samples before the crises, the Cox–Snell method of the Asian Financial Crisis provided the best fit. However, after the crises, the ERM crisis has a relatively closer fit than the Mexico Tequila crisis. The remaining plots show that the parametric survival models provide a relatively reasonable fit to the crisis data.

<table>
<tr><td>Recession Periods (1980 – 2008)</td><td>(a)</td><td colspan="3"> 
</td></tr>
<tr><td></td><td colspan="2">Before Crisis</td><td colspan="2">After Crisis</td></tr>
<tr><td>The ERM Crisis (1992/2)</td><td>(b)</td><td> 
</td><td>(e)</td><td> 
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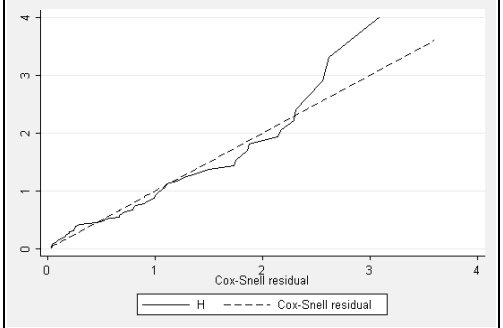
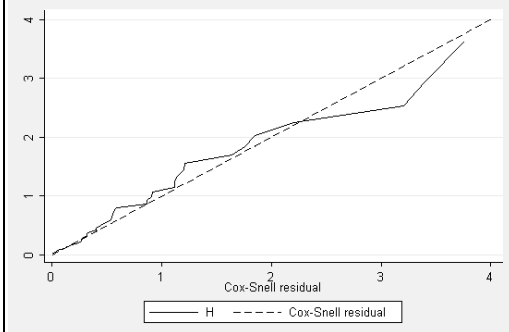
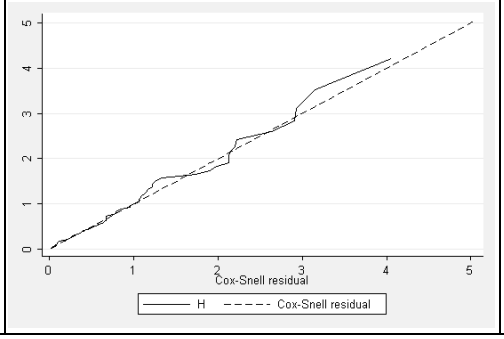
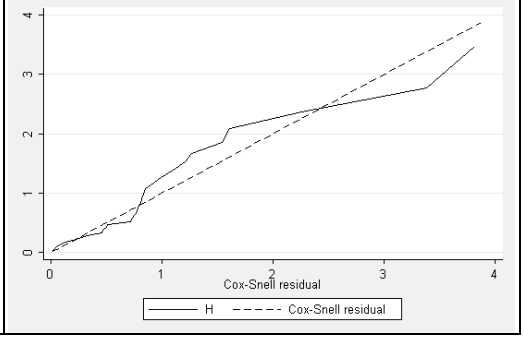
<tr><td>The Mexico Tequila Crisis (1994/12)</td><td>(c)</td><td> 
</td><td>(f)</td><td> 
</td></tr>
<tr><td>The Asian Financial Crisis (1997/7)</td><td>(d)</td><td> 
</td><td>(g)</td><td> 
</td></tr>
</table>

Figure 2. Prediction for Cox-Snell residuals of Survival Analysis

6. Conclusions and Limitations

Macroeconomic and monetary factors are constantly adjusted by economists to reduce the negative effects of business cycle contractions. To obtain this objective, the study utilized parametric shared-frailty models to observe 22 countries' recession periods, considering particularly the periods before and after the currency crises. For all recession periods, a constant increase in CCPs, DC/GDP ratio, FERs, FDI/GDP ratio, and M0/FER ratio can shorten the recessions of economies. However, a steady rise in REERs, economic openness, and lending-to-deposit ratio tends to lengthen recessions. Among the ten variables considered, only DR and FD/Ex ratio did not affect the exit times.

Of the 22 countries considered, 18 were advanced countries. The findings agree with those of Kose et al. (2003), who proved that trade and financial integration is stronger for industrial countries. DC/GDP ratio and FD/Ex ratio were found to be consistent factors before crises, which is consistent with the observation of Beaton (2009). The author found that credit availability plays an important role in the economy. FDI/GDP ratio was maintained after crises. This is related to the work of Schneider and Tornell (2004) where financing opportunities were found to have a significant effect after crises. A more unique result of the study is the divergence found among economies after the crises, whereas no obvious difference was observed before the crises. This paper also observed that after-crises findings have longer exit times than the before-crises results. This observation is again hypothesized to be related to the conclusions of Schneider and Tornell (2004), namely, some economies have more financing opportunities, whereas others have relatively small opportunities and even face enforceability problems.

This research concludes that the relatively new parametric shared-frailty models are applicable to business cycles after obtaining results interrelated with those of previous works regarding the effect of macroeconomic and monetary variables. This paper also suggests additional insights for policy makers, wherein significant variables were found to be very strong factors during economic downturns and should be considered when formulating monetary policies.

This research acknowledges some possible limitations because of the presence of mixed, inconsistent, and insignificant findings in the other variables. Thus, it is suggested that researchers and academicians explore the potency of other factors (i.e. fiscal variables such as taxes, and financial factors such as broad-based stock market indices) aside from macroeconomic and monetary factors. The paper also used a relatively larger number of advanced economies compared to developing and emerging countries. It is further recommended that future studies should expand the data to include these under represented group of countries. Although, the relatively new parametric shared-frailty models gave satisfactory findings, it is still suggested that future researches explore other models (e.g., logit probit models, grey relational analysis or artificial neural networks) that may be applicable in determining factors that affect business cycles.

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