

**PDBP**  
**Research Proposal**

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*The Analysis of Channels of the Monetary Transmission Mechanism in Korea  
Before and After the Financial Crisis in 1997*

This paper is an empirical study into which channels are the key channels of the monetary transmission mechanism in Korea before and after the financial crisis in 1999. This study reveals how a Korean monetary transmission mechanism evolved in the tumultuous decade of the 1990s. The primary forces determining this evolution were institutional reforms in the financial markets and the constraints imposed by being a small open economy with high capital mobility. The four channels, the interest rate channel, the credit channel, the asset price channel, and the exchange rate channel, will be evaluated to discover their effectiveness as conduits of monetary transmission mechanism.

## 1. Introduction

The monetary transmission mechanism describes how changes in money stocks or interest rates bring about changes in the country's key economic indicators such as gross domestic product, prices, or employment.<sup>1</sup> While this definition sounds simple, the actual ways in which the mechanism works in the real world are quite complex and are not straightforward. There are several channels through which monetary policies are transmitted. The channels are the interest rate channel, the credit channel, the asset price channel, and the exchange rate channel. In this paper we study Korea, a small open economy, to evaluate the effectiveness of those channels before and after the financial crisis in 1997. Following the Asian financial crisis in 1997, the Korean financial market was experienced profound institutional changes. Therefore, it is interesting for us to evaluate the channels before and after the crisis. Knowing the effectiveness of the channels is crucial for monetary policymakers to formulate and implement monetary policies.

In this study, we will try to answer the questions that the policy makers may be interested in. The questions are as follows;

- Do the monetary policy changes affect both output and price?
- What channels are the effective ones before and after the crisis?

We compare the transmission mechanism in the two time periods bisected by the Asian crisis; namely, the pre-crisis period before the crisis (1990 – 1996) and the post-crisis period after the crisis (1998(9) – 2008).

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<sup>1</sup> See Sellon (2004) and Taylor (2000) for divergent views on the transmission mechanism

Many studies have shown that changes in monetary policy are mostly transmitted to the economy through four major channels – the interest rate channel, the asset price channel, the bank credit channel, and the exchange rate channel (See Mishkin, 1995). In the study of the function of these channels, it is critical to identify those policy variables that are exogenous and yet significantly influence the economic performance. Once policy variables are identified, their statistical relevance can be measured by disturbance terms in a system of analytical equations, as shown by Berument (2001, p.2). In this study, we employ vector autoregression (VAR)<sup>2</sup> analysis to evaluate the channels.

## **2. Financial Reform and Financial Instability**

Korea has led other emerging economies in Asia in implementing financial liberalization. It initiated this reform of its financial markets in the mid-1980s. It implemented even more ambitious reforms in the early 1990s in order to become a member of the OECD, which it joined in 1996. It should be noted that financial liberalization is a two-edged sword: On one hand financial liberalization is necessary for the optimal use of capital; it improves the efficiency of the country's financial markets. On the other hand, financial liberalization has often destabilized many domestic markets, of small open economies in particular.<sup>3</sup>

In 1997-98, in the aftermath of the Asian financial crisis, Korea was forced to undertake financial sector restructuring under the terms of conditional lending by the IMF. Since the IMF-

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<sup>2</sup> Vector autoregression (VAR) is an econometric technique that reveals the interrelationships among multiple time series variables, generalizing the univariate autoregression (AR) models. The most basic form of a VAR treats all variables symmetrically without making reference to the issue of dependence versus independence. In a VAR, the time path of each variable can be affected by current and past realizations of other variables' sequences (Enders, 1995).

<sup>3</sup> See Bekaert, Harvey and Lundblad (2003)

mandated restructuring constituted the catalyst for the sweeping reforms of Korea's financial sector, we discuss below the chronology of events in order to provide some background information for both the pre- and post-crisis periods.

## **2.1. Pre-Crisis Reforms**

In March 1990, the Korean government adopted a variation of a managed floating exchange rate. More specifically, in 1991 it amended the Foreign Exchange Management Act (FEMA) that encouraged inflows of foreign capital (Park, 1995). Nonresidents were allowed to purchase Korean stocks up to three percent of the outstanding shares of each company per individual, but no more than ten percent of a company in total. In June 1993, the Korean government announced a plan for financial liberalization and opening of the financial sector, which aimed at substantial progress in the deregulation of domestic financial markets. Capital outflows were liberalized and restrictions of direct investment of domestic residents and institutional investors were lifted significantly.

Along with the opening of its capital markets to foreign investors, Korea lifted restrictions on the lending activities, securitization and offshore banking activities of Korean banks and non-financial businesses (Kregel, 1998). In particular, its short-term finance companies were converted into investment banks, which could raise funds in offshore markets. According to the Korean Securities Supervisory Board, 28 Korean securities firms operated over 100 funds with assets of nearly \$3 billion located in Malaysia, Ireland and France before the Asian currency crisis.<sup>4</sup> In 1996 alone, Korean entities issued \$16 billion worth of bonds overseas, or approximately 37 percent of all offshore bonds raised by developing economies in

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<sup>4</sup> *Korean Times*, February 19, 1998 as reported in Kregel (1998, p.6).

Asia in the year (Kregel, 1998, p.6). All these liberalization policies contributed to a large inflow of foreign capital in the early 1990s, and bank lending increased.

In summary, viewed from the monetary policy perspective, the pre-crisis financial liberalization and reforms were characterized by policy actions designed to broaden the country's capital markets in the long run and to ameliorate its weakening current account situation in the short run. It should be noted, however, that the large amount of capital inflow later aggravated the country's economic problems, largely because the Korean won was pegged to the dollar. (Hahm and Mishkin, 2000, pp 5-6).

## **2.2. Post-Crisis Reforms**

Financial crisis often follows prior monetary and credit expansion. The Asian financial crisis was no exception. Financial liberalization gave rise to monetary and credit expansion. This led to depreciation of the Won which required high interest rate to defend the currency which, in turn, made borrowers unable to make their debt repayments. Since it was easy for Korean businesses and banks to borrow funds denominated in foreign currencies, their debt burden increased rapidly when there was an unanticipated devaluation of the Korean Won.<sup>5</sup> In retrospect, Korean banks and large borrowers lacked manpower and management expertise on risk assessment, which was aggravated by weak financial regulation and supervision (Hahm and Mishkin, pp 5-6).

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<sup>5</sup> It should be noted that the IMF wanted interest rates set at levels that were high enough to generate demand for domestic currency, while the Korean businesses, banks and government wanted interest rate set low enough to allow firm and banks to make their payment obligations (Kregel, 1998, p.18). The IMF prevailed.

Under the IMF program, the Korean government undertook an extensive liberalization of the capital market in order to attract foreign capital and to stabilize the foreign currency claims. In December 1997, a fully-fledged floating exchange rate system was introduced. Subsequently, all institutional restrictions on mergers and acquisitions of domestic firms by foreign investors were completely abolished. In addition, the real estate market was completely opened in May 1998. In April 1999, the new Foreign Exchange Transactions Law was passed. Foreign exchange and capital account transactions by individuals were allowed and all vestiges of restrictions on foreign exchange transactions by corporations and financial institutions were eliminated (Kim, 2004).

On the monetary policy front, explicit inflation targeting was introduced, and the operating target of the monetary policy was shifted from money aggregates (M2) to short-term interest rates. There were several reasons for this shift in operating target. First, short term interest rates were more transparent and easier to monitor than aggregate quantity variables, such as the M2. Second, international investors demanded a more frequently observable variable than monetary aggregates to gauge the country's monetary policy stance. Third, the drastic financial market restructuring in the post-crisis environment casts serious doubts on the short- and long-run stability of the relationship between monetary aggregates (M2 in particular) and real economic variables (Cho, 2002).

### **3. Literature Review**

There is extensive empirical research on the monetary transmission mechanism. The researchers have tried to identify the channels for the monetary transmission mechanism and to do empirical study for countries.

Mishkin (1995) described a variety of channels for monetary transmission mechanism including the following channels:

- The interest rate channel
- The exchange rate channel
- The asset price channel
- The credit channel

After the financial crisis in 1997, there are broad studies on evaluating the effectiveness of monetary transmission mechanism in Korea. However, most previous studies had done around 2000 and focused on the credit channels. Ding, Domac, and Ferri (1998), Domac and Ferri (1998), Ferri and Kang (1998), Kim (1999), Ghosh and Ghosh (1998), and Borensztein and Lee (2002) studied a credit crunch using the credit channel. It was an important issue with monetary contraction in Korea after the crisis. They mainly used the cross sectional analysis. In addition, all of above channels has not been evaluated even though it will be meaningful for policymakers to identify the effectiveness of channels through the structural change of financial market in Korea.

Al-Mashat and Billmeier (2007) studied the monetary transmission mechanism in Egypt testing all above channels. They found the exchange rate channel plays a strong role in propagating monetary shocks to output and prices and most other channels are rather weak. Hung and Pfau (2009) studied the monetary transmission mechanism in Vietnam. They found the credit and exchange rate channels are more important than the interest rate channel. Both studies used a VAR model approach. In this paper, a VAR model will be employed.

#### **4. The Methodology**

In this study we consider a reduced-form equation of the economy as follows:

$$X_t = A_0 + A_1(L)X_t + e_t \quad (1)$$

where  $A_0$  is an  $n \times 1$  constant vector,  $A_1$  is a matrix polynomial in the lag operator  $L$ <sup>6</sup>,  $X_t$  is an  $n \times 1$  data vector, and  $e_t$  is an  $n \times 1$  disturbance vector.

We obtain the reduced-form equation from the structural-form equation<sup>7</sup> that can be converted. Therefore, an explanation regarding the relationship between disturbance terms in both forms for the identification is in order. In the structural form equations, we have white noise disturbances ( $\varepsilon_t$ ) by assumption.  $\varepsilon_t$  has zero mean and constant variance and is individually serially uncorrelated. The variance and covariance matrix ( $\Sigma_\varepsilon$ ) of  $\varepsilon_t$  is a diagonal matrix. The elements of the diagonal matrix are the variances of structural disturbances.

The error terms in the reduced form equations are linear combinations of the structural disturbances. We can define the relationship between error terms in both forms as follows;

$$e_t = G\varepsilon_t \quad (2-1)$$

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<sup>6</sup> The lag operator  $L$  is defined to be a linear operator such that for any value  $X_t$

$$L^i X_t \equiv X_{t-i}$$

For example,  $A(L) = a_1L + a_2L^2 + \dots + a_pL^p$ .  $A(L)$  can be viewed as a polynomial in the lag operator (Enders, 1995).

<sup>7</sup> The structural form of equation system comes from the economic theories. The endogenous variables are in the equations of system. The reduced form of a system of equations is derived from the solution for the endogenous variables in the system of equations. In other words, the endogenous variables depend on the exogeneous variables. In a VAR, the reduce form means that the current value of each variable depends on past values of other variables (Enders, 1995).

$$\Sigma = Ee_t e_t' = EG\varepsilon_t \varepsilon_t' G' = G \Sigma_\varepsilon G' \quad (2-2)$$

where  $\Sigma$  is the variance and covariance matrix of  $e_t$  and  $G$  and  $\Sigma_\varepsilon$  are  $n \times n$  matrices.

We need to impose at least  $(n^2 - n)/2$  restrictions on  $G$  to identify both sides in (2-1). There are several ways to obtain the impulse responses. In this paper, we use the Choleski decomposition<sup>8</sup> suggested by Sims (1980).<sup>9</sup> Since  $G$  is a lower triangular matrix by the Choleski decomposition, we can have a recursive structure between error terms in both forms, and we can also have the number of restrictions identified exactly.

#### 4-1. VAR Model

In this paper, we analyze the effects of monetary policy shocks on domestic variables, like output and price.

The vector of variables in the baseline model is {OP, USFFR, KIP, KCPI, KCR (KM2)}, where OP is the oil price in terms of U.S. dollars, USFFR is the U.S. Federal Funds Rate, KIP is Korean industrial production (a proxy for GDP), KCPI is the Korean consumer price index, KCR is a Korean short term interest rate (Call Rate) that is a money market rate, KM2 is a Korean monetary aggregate.

The first variable, OP, is introduced as a proxy for negative and inflationary supply shocks. If the monetary authority, facing a negative and inflationary supply shock from changes

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<sup>8</sup> In order to make a more usable form, the reduced form is derived. In this transforming process, without restricting some variables, the information in a structural form cannot be recovered in the estimates of the reduced form because the number of parameters is different in both forms. A way to identify the model is the Choleski decomposition that restricts some contemporaneous effects. Decomposing in this fashion uses a lower triangular matrix like  $G$  in our paper (Enders, 1995).

<sup>9</sup> We tested several identification schemes. The impulse responses were not much different under those schemes.

in oil price, uses a contractionary monetary policy, the responses in domestic macroeconomic variables reflect the effects of both the monetary contraction and a negative and inflationary supply shock. Introducing OP, we can control the effect of this kind of shock.

The second variable, USFFR, is introduced to control the component of domestic monetary policy that reacts to exogenous monetary policy shocks (the U.S. monetary policy shocks). We consider OP and USFFR as exogenous variables. This implies that there is no feedback from the Korean domestic variables to these two variables. However, we allow for the contemporaneous effects of exogenous variables on the Korean domestic variables. {KIP, KCPI, KCR (KM2)} are well-known variables in identifying monetary policy shocks.

After estimating a basic model, the additional endogenous variables will be added to evaluate the effects of specific channels. The variables are {RLR, REER, SRI, CREDIT}. RLR is a real lending rate (banking lending rate – inflation) and will be used for the interest rate channel. REER is an index of the real effective exchange rate and will be used for the exchange rate channel. SRI is a stock price index in Korea and will be used for the asset price channel. CREDIT is a domestic credit in Korea and will be used for the credit channel.

In this study, we will analyze the effects of monetary shocks on output and price level using the Granger causality test, variance decomposition, and impulse response functions under the setting of VAR model.

The variables will be obtained from the International Monetary Fund's International Financial Statistics (IFS) and the Bank of Korea. All variables used in this study are monthly, and they are expressed in logs except the interest rates.

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