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Nehad A A Khanfar

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## Contents

**Nehad A A Khanfar**

A Critical Analysis of the Concept of Gharar in Islamic Financial Contracts: Different Perspective ..... 1

**Paria Assadolahi Nik, MansourJusoh, Abu Hassan Shaari  
and Tamat Sarmdi**

Predicting the Probability of Financial Crisis in Emerging Countries Using an Early Warning System: Artificial Neural Network ..... 25

**Kok Sook Ching, Qaiser Munir and Arsiah Bahron**

Malaysian Banking Sector Efficiency, Structural Breaks and Cross-Sectional Dependence: Empirical Evidence ..... 41

**Duygu Zirek, Fusun Celebi and M. Kabir Hassan**

The Islamic Banking and Economic Growth Nexus: A Panel VAR Analysis for Organization Islamic Cooperation (OIC) Countries..... 69

**Bora Özkan, M. Kabir Hassan and Ali Hepşen**

Returns Predictability in Emerging Housing Markets ..... 101

**Mehmed Ganić, Betül Ismić and Sahrudin Sarajčić**

Does Financial Deepening spur the Economic growth?  
Evidence from Bosnia and Herzegovina..... 131



## EDITORIAL NOTE

In this Special Issue of the Journal of Economic Cooperation and Development – March 2016 - I have the privilege to present you with the theme 'Banking and Finance'. The process of any contemporary economic system is based on money, finance and banking, all of which are instrumental for the level of production and consumption activities as well as for other financial operations within and across countries. The nature and role of finance and banking boom the financial market and increase the magnitudes of production and consumption activities by allowing credits, yet considering the notion of Islamic banking from a global micro-economic perspective.

This March issue contains six remarkable articles which shed light on themes related to Islamic financial contracts, financial crisis in emerging countries, efficiency in the banking sector, Islamic banking and economic growth, emerging housing markets and financial deepening.

The first article examines and explores whether the understanding of Gharar, a strictly prohibited element in Islamic financial contracts and transactions, is in line with the Qur'anic teachings. It also tries to examine a new understanding of gharar against misrepresentation and fraud, which is fundamentally different from the conventional interpretation.

The second article analyses the factors associated with the emergence of financial crisis in BRIC countries during 1992-2011 and compares the importance and significance of all variables in the model in which the domestic credit to private sector (% of GDP, domestic credit growth), Inflation, freedom, interest rate and economic growth were discovered to be the most significant variables in this model, while the deposit insurance rate was found to be the least significant variable in explaining the crisis

The third article examines the weak-form market efficiency of the Malaysian commercial banks over the period of 17 October 1994 to 23 May 2014 by applying powerful panel stationarity tests that allow for the presence of multiple structural breaks and exploit the cross-section variation of the bank prices series.

The fourth article investigates the impact of Islamic banking variables on economic growth in a panel setting for 14 member countries of the Organisation of Islamic Countries (OIC) between 1999 and 2011 by employing the Panel VAR method to examine the short-run effects as well as long-run effects. As a result, shocks in Islamic banking contribute to

more than 3% of the forecast error in economic growth in the next 10 year period.

The fifth article searches for a link between house prices, broad money, private credit and the macro-economy among 19 emerging markets and explains which variables predict the emerging markets house price index returns. The article also investigates the relationship among variables as well as the direction of the relationship and how house prices significantly affect the future broad money, private credit and macro variables.

The sixth and last article focuses on the exploration of the causal link between the degree of financial deepening and economic growth in Bosnia and Herzegovina (B&H) by employing ARDL cointegration estimation methodology. It also touches upon the behaviour of economic growth which was strongly influenced by the quality of the financial sector environment and aid effectiveness over the sample period.

Amb. Musa KULAKLIKAYA  
Editor-in-chief

## **A Critical Analysis of the Concept of Gharar in Islamic Financial Contracts: Different Perspective**

Nehad A A Khanfar<sup>1</sup>

*Gharar* is one of the most strictly prohibited elements in Islamic financial contracts and transactions. With regards to financial and commercial contracts, *gharar* is treated as excessive risk, uncertainty, and speculation by most Muslim scholars. This paper will critically examine and explore whether this understanding of *gharar* is in line with the Qur'anic teachings. It also tries to examine a new understanding of *gharar* in against misrepresentation and fraud, which is fundamentally different from the conventional interpretation. This paper will try to introduce a new and modernized concept relying on Qur'anic understanding of *gharar* and new understanding of Arabic language contexts.

### **Introduction**

Different definitions of *gharar* are provided by the Muslim scholars. *Gharar* defined as uncertainty means the non-existence of the contract's subject matter (Ali and Ahmad, 2007, p.54). (Al-Qarafi, 1998, p.275) provides a similar definition, and the *Hanafi* and *Shafi'i* doctrines also adopted this view (Al-Saati, 2003, p.6). In following this *gharar* meaning, Ali and Ahmad (2007, p.54) state that *gharar* is "deception, danger, and risk", and misrepresents one of the contract elements, such as price, quantity, and contract performance, to the other party so that they enter the contract under excessive risk (p.303). Interpreting *gharar* as risk or uncertainty established an opinion that minor *gharar* is allowed because it does not seriously affect the contract, which would remain valid. On the other hand, excessive *gharar* is prohibited because it causes conflict and problems between contracting parties. With this perception, it has been stated that *gharar* does not affect gratuitous or

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donation contracts (Al-Dareer, 1997). This paper tries to critically examine different views attempting to directly consult the *Qur'an* and linguistic understanding, as will be demonstrated in the following discussion.

### ***Gharar*, an unstable and confused concept**

As mentioned above, some of the Muslim scholars consider the contract valid if it involves minor *gharar*, because their concept of *gharar* is restricted to the level of risk or uncertainty. This means that they allow minor risk or uncertainty. It would not be the same situation if *gharar* was considered to mean misrepresentation, which is *haram* (prohibited) (Hayder, 1991, p.191). *Gharar* meaning misrepresentation is not classified into clear categories such as innocent, negligent, or fraudulent, as under English contract law. Islamic law does not deal with minor or excessive *gharar* as fraud or misrepresentation because it is considered to be a “serious moral wrong” (Rayner, 1991, p.206).

Discussing more definitions of *gharar* reveals serious levels of difference and confusion between the scholars. For example, it can be found that (Ayyash 2003, p.13) classifies *gharar* as an ambiguity, which is interpreted by others as *jahalah* (Ghuddah, 1985, p.39), but (Faruqi 2005, p.346) interpreted *jahalah* as ignorance. Al-Sanhuri defined *jahalah* as a lack of knowledge, implying that there is a point of distinction between *jahalah* and *gharar*. He suggested that *gharar* occurs when selling something with unknown existence, whereas *jahalah* occurs when selling something that already exists but with unspecified quantity. In fact, saying that the subject matter of a contract does not exist, as a meaning of *gharar*, would be different from saying that the subject matter does exist but with some uncertainty regarding the other elements of the contract. It is clear that many of the scholars confuse both terms, attributing the same meaning to them and using the words interchangeably (Al-Sanhuri, 1955, p.232), as is mentioned above. The concept of *gharar* and the differences between its definitions has attracted critical opinions with regards to the distinction between *jahalah* and *gharar*.

Saleh (1986, as cited in Hasanuzzaman, 1991, p.122) stated that *gharar* refers to the nature of the contract, but *jahalah* refers to the defective description of the contract. He added that when the contract involves

*jahalah*, it will be voidable, but if the contract involves *gharar*, it will be void. In the case of *gharar*, all the parties would be affected, but in the case of *jahalah* only one party would be affected. According to this perspective, *gharar* and *jahalah* are clearly not the same, and do not have either the same rules or concepts. This shows that *gharar* is different from *jahalah*. A worthy opinion to note with regards to ignorance suggests that *gharar* would be established when the contracting parties use deception to induce the other party into ignorance (Sarker, na, p.2), but ignorance itself would not be considered as *gharar*. (Obaidullah 2004, p.3) has another discretion related to the *jahalah* implication. He argues that a contract or transaction under Islamic law must be free from *jahalah*, which is considered as misrepresentation. In a different paper, though, (Obaidullah, 2001) suggests that a contract under Islamic law should be free from misrepresentation, which means lack of information disclosure, not *jahalah* (ignorance) as stated in his paper mentioned above. Furthermore, it has been found that Obaidullah considered *gharar* an excessive uncertainty, in line with other traditional interpretations of *gharar*, which shows how different opinions have been adopted by the same author. Obaidullah is one of the clear examples of contradictory interpretations of *gharar*, which calls for the different meanings to be unified and reformulated into one concept and term (Obaidullah, 2001).

Despite this argument, Nordin & Abdul Aziz, Et al, (2014) remarkably, argued that although *gharar* carries wider meaning than *jahalah* but the latter existence in transaction can establish *gharar*. That is to say in spite of the differences between *gharar* and *jahalah* but there is a relation between both terms as a cause and result. Namely if, in specific circumstances, *gharar* exists in the transactions this could be a result of *jahalah*.

### ***Gharar* and its linguistic origins**

One of the modern Muslim scholars suggests that *gharar* means risk, but entails delusion and deception (Addareer, 1990, p.27). This viewpoint fits with that of this research, and is clarified and supported by the Arabic-English translation, which translates *gharra* as “to mislead, to deceive” (Baalbaki, 2005, p.292). The verb *gharra* is the past tense of the noun *gharar*. As a result, *gharar* is translated as misleading or

deception (Ebrahim and Rahman, 2005, p.274). In general, the jurists define *gharar* in many different ways, resulting in contradictory concepts (El-Gamal, 2001, p.5). (Al-Saati, 2003, p.6). states that the verbal noun of *gharar* is *taghreer*, adding “it means deception or misrepresentation” In fact, this is what is literally found in the *Ottoman Journal of Equity* (Article 164 ) where *taghreer* is defined as “describing the sold item for the buyer contrary to its real description”

The *Ottoman Journal of Equity* defines *taghreer* as fraud (*khida'a*). Based on this, the defrauder is a misrepresenter (*mugharrir*) and the defrauded person is a misrepresentee (*maghroor*) (Hayder, 1991, p.264) or (*mogharrar bihi*). One of the modern Muslim scholars defines *taghreer* as when “one party deceives the other contractual party using fraudulent means to induce him to enter the contract that he would not enter without using these means” (Aljoufan, 2006).

### ***Gharar*, different words with the same meaning**

It is worth noting that, conceptually, misrepresentation is parallel to fraud and cheating under the Islamic legal term, and also that the Islamic definition of (*gharar*) is not consistent among either early or contemporary Muslim scholars. Papers produced by the Islamic Research & Training Institute<sup>3</sup> reveal contradictory signals given by Muslim scholars' understanding of *gharar* (misrepresentation)<sup>4</sup> and similar legal terms<sup>5</sup>. In one of the institute's papers, it has been found that the concept of *tadlees* was presented with three different meanings. The first meaning was that of fraud (Ali and Ahmad, 2007, p.53); the second, on the same page of the same paper, interpreted *tadlees* as misrepresentation, with fraud interpreted differently as *ghabn* (p.53); and the third in the paper glossary, translated *tadlees* as cheating (p.304). Finally, contradicting the previous interpretations, the same paper stated that *ghabn* was prohibited under Islamic contracts or transactions because it implied deception and misrepresentation or cheating (p.21, note 2).

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<sup>3</sup> This institution attracts and employs Muslim scholars from different Islamic and Arabic countries, with backgrounds in a variety of Islamic doctrines.

<sup>4</sup> Misrepresentation as the meaning of *gharar* is adopted by the author of this paper.

<sup>5</sup> This organization is considered to be one of the best Islamic institutes, which is interested in improving and developing Islamic banking and finance, in addition to issuing many papers in this area researched by highly qualified academic staff and practitioners.

Still in the same paper, *gharar* is considered to mean deception, danger, or uncertainty (p.303, note 2). As can be seen, each word has different meanings. Obviously, we can come to two conclusions from the discussion above. First, Islamic jurisprudence does not differentiate between fraud, misrepresentation, cheating, or deception. In other words, in schools of Islamic jurisprudence *tadlees*, *gharar*, *ghabn*, and *ghish* are all words expressing the same meaning and connotation. It is worth noting that for some scholars ‘*taghrir*, *ghush*, *ghabn al-fahish*’ and *tadlees* all reflect the meaning of fraud (Adil, Muhamad Et al 2010). This leads to consider that those terms may fall under the meaning of *gharar*. Their relation also can be understood in term of that *gharar* represents the general aspect and others would represent specific meaning. In this case more investigation has to be carried out in order to academically examine and define the relation between *gharar* and the other similar terms.

Second, the concept is understood differently, according to which school a scholar is loyal to. Admittedly, it is difficult to follow all Muslim schools in this regard, as there has been no thorough academic analysis explaining these possible differences. It is worth mentioning, though, that there is no dispute between the Muslim jurists about the importance of the legal position of *gharar*; but disputes do arise with regard to its practical implementation, relying on customary applications, which are different from place to place. It can be noted, for instance, that Imam Malik gave an explicit definition of the sale of *ghārār*, as a transaction depends on luck with uncertain outcome (Razali, 2008, p401). This leads to many controversial practical points (Saleh 1986, as cited in Hasanuzzaman, 1991, p.122), as discussed in this paper. As will be seen later on, discussing *gharar* will explain that the Islamic understanding of *gharar* that is derived from the *Qur’an* is linked to the concept of misrepresentation and similar meanings.

### ***Gharar*, the Qur’anic meaning**

Considering *gharar* as prohibited (*haram*) conduct from the believers’ point of view comes with reference to the danger of fraud and deception, by alerting people who practise *gharar* to stop doing so, as it is against God (Allah). Allah describes those who defraud or deceive as people with diseased hearts, both ethically and behaviourally. Making this

point, the *Qur'an* considers deceit and fraud to be linked to the habit of lying. All the previous conducts and behaviours are described as corruption and people who practise them as corrupters (Qur'an 2:9,10,11). Furthermore, the *Qur'an* encourages people to avoid dealing with delusions (45:35), which means *khida'a*, *gharar*, and *tadlees* (Ba'albaki, 2006, p.259). Tracking the meaning of delusion here as *khida'a* or *tadlees*, indicated as being elements of *gharar* or *taghreer* in the Arabic-Arabic dictionary, *taghreer* is regarded as an action of *gharar* (Manthour, n.d., pp. 3232-3234).

It is noted that the *Qur'an* maintains the same line of argument, teaching the people and Muslims that they must avoid *gharar* or anything related to it, due to its connection with Satan's behaviours (4:120). In Islamic traditions, anything connected to or referring to Satan is not acceptable either religiously or ethically. This can be seen in the same connotation in a different verse (17:64). For more emphasis, the *Qur'an* warned the Prophet Muhammad not to be misrepresented by the non-believers (40:4). The Prophet emphasized on that and confirmed the prohibition of *gharar* in the Hadith (Ibn Majjah, n.d. hadith no. 2195). The Qur'anic teaching continues to encourage people not to rely on *gharar* in their life (57:14,20). For the sake of accuracy, all the verses refer to *gharar* using one of its verbs or nouns and expressions such as *gharrah*, *ghoroor*, *yaghorranakah*, *gharrakah*, *gharrakum*. Following the translation from English to Arabic and vice versa, especially in the commercial/financial dictionary, the direct meaning of misrepresentation includes all the aforementioned words or expressions (Faruqi, 2005, p.460). This fits the definition of the verbal noun *gharar* when the *Ottoman Journal of Equity* (Article 164 ) stated that "*taghreer*: is describing the sold item for the buyer contrary to its real description"

In accordance with the viewpoint of this research, using the most common definitions of *gharar* as risk or uncertainty attracts a lot of argument and discussion among the scholars and jurists. The concept of *gharar* is very clear in the Qur'anic teachings and instructions. Based on that, *gharar* as misrepresentation includes fraud, deception, beguiling, and delusion. As shown earlier, all of these words or terms are found in the *Qur'an* as prohibited (*haram*) behaviours or conducts. It is clear that the *Qur'an* strongly emphasizes and insists that *gharar* and all its related concepts are not acceptable in Islamic law. This is evident because the *Qur'an* considers *gharar* as the badness of the devil, and describes

*gharar* as being the continuous and practised work of Satan. Based on this analytical view, it can be concluded that neither Muslims in general nor Muslim jurists or scholars in particular would disagree with treating *gharar* as impermissible in Islamic contracts, which fits with all the Qur'anic and Islamic law philosophies.

It is difficult to accept the idea that a certain amount of *gharar* can be permissible, and then move on to discuss how much *gharar* is permissible (Abdelwahab, 2007, p.99). Unfortunately, this discussion has developed without referring to what the *Qur'an* says in this regard, or what professional *Arab* linguists have said in this context. This has led to many contradictions and many controversial points, as mentioned above, and will be explained further later on. The concentration on the teachings of the *Qur'an* gives the reader or the researcher a clear understanding of the Islamic way of life. The first step to a deep understanding of the Qur'anic context is having a strong knowledge of the Arabic language. Based on that, this author finds it strange that most of the authors who have written about Islamic contract law, and realized how important it is for a contract to be free from *gharar*, still define *gharar* as risk or uncertainty, which is usually established in any commercial transaction around the world.

It is worth mentioning here that Islamic financial contracts in general, and *musharakah* and *mudarabah* contracts in particular, are built on risk-sharing (*mukhatarah*) between the contracting partners, relying on profit/loss-sharing principles. In addition, these contracts carry a level of risk (*mukhatarah*) with regard to the project results (see Khan, 1996) which some types of it is permissible (Al-Badani, 2014, p396). This suggests that risk-sharing in *musharakah* and *mudarabah* would not be considered as a meaning of *gharar*, which is prohibited in Islamic contracts, regards both these contracts and any other types as dealing with interest (*riba*) (Rosly, Sanusi and Yasin, 2009, p.3). Most authors who have written about *gharar* describe it as an unacceptable or excessive risk (gambling or *qimar*) undertaken by the contracting parties, where 'the risk of loss and the loss of one means gain for the other (Paldi, 2014, p254). They usually add that avoidance of *gharar* is an essential principle in all Islamic contracts or transactions that depend on Islamic financial or commercial rules. They also consider the importance of prohibiting *gharar* as a type of gambling (Richardson,

2006, p.127). It is strange to have *gharar* considered as gambling, as this concept is directly mentioned in the *Qur'an*, using a completely different term and meaning from that of *gharar*.<sup>6</sup> Under the sub-topic “permissible *gharar*”, Al-Saati, a contemporary scholar, has quoted Shatibi’s opinion, a traditional Muslim scholar, that the *Hadith* (the Prophet Muhammad’s speech) that prohibited *gharar* was not intended to prohibit all categories or types of *gharar*. Based on this view, Muslim scholars have allowed some kinds of transactions such as selling unseen products still growing in the ground (onions, carrots, and radishes), and they have also permitted the sale of houses that have not yet had the foundations laid. He also argues that the *Hadith* only intended to prohibit *gharar* that led to conflict between the contracting parties, which cannot be tolerated in Islamic law (Al-Saati, 2003, p.10).

Describing *gharar* as deceit, fraud, or misrepresentation in the *Qur'an* gives no option to discuss the permissibility and impermissibility of *gharar*. Therefore, there is no logic in suggesting that some *gharar* is permissible and other *gharar* is not. Prohibiting (*tahreem*) *gharar* is very clear by Qur’anic evidence, which prevents Muslims from making any transaction that involves fraud, deceit, or cheating. A contradiction can also be seen when *gharar* is defined as speculation; an example of “speculation” is when parties have formed their contract on lost goods, referring to the selling of lost commodities (Bakhshi, 2006, p.14), which is not a proper one. This is because, if someone sold lost goods, this is more likely to be *gharar* as a form of misrepresentation, not speculation.

### ***Gharar*, misrepresentation and fraud**

It is clear that *gharar* is more aligned with the concept of misrepresentation under English contract law, rather than any other similar concepts. Misrepresentation under English common law is considered to be a false statement or representation about fact that is made to induce the other party to enter a contract. This definition has a parallel definition in the context of fraud, which is defined as a false representation of fact, whether this misrepresentation is made intentionally (knowingly), without believing it to be true, or carelessly (Curzon, 2002, p.183). This suggests that fraud or deceit reflects the meaning of *gharar*, as well as cheating. The analytical approach of this

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<sup>6</sup> Further details will be discussed later on in this paper to explain gambling.

paper, using the Arabic-Arabic dictionaries, has found that the verb *gharra* means to misrepresent or to defraud, which puts misrepresentation and fraud in the same category or classification. This falls under the same purpose of the Prophet's Hadith when prohibited the sale of unborn animals and uncaptured birds (An-Nawawi, 1987, p156). As mentioned earlier in this paper, English-Arabic dictionaries translate misrepresentation using the words *khida'a*, *tadlees* (fraud), and *kathib* (lying), and they state that misrepresentation means the releasing of a false statement by the misrepresenter about fact to induce the other party to achieve the misrepresenter's desires (Faruqi, 2005, p.460). This meaning can be translated to mean "misleading" as well (Faruqi, 2005, p.459). It can be seen that the contradictory definitions of *gharar* among Muslim scholars are not based on the Qur'anic verses discussing *gharar*.

Defining *gharar* as risk or uncertainty raises some questions with regards to the applicability of Islamic contracts in non-Islamic courts. These questions arise if the contracting parties decide that the contracts are governed by Islamic law in non-Islamic courts. The problem starts if one of the parties claims against *gharar*, and asks the court to nullify the contract as result of *gharar*, considering it as risk, uncertainty, and speculation. It has been suggested, in an actual case, that the court would face some difficulties in making a decision due to the ambiguity of elements of *gharar*. In addition, the court could conclude that one of the reasons for *gharar* as speculation being prohibited under Islamic law is that only Allah can predict and know the future (Trumbull, 2006, pp.611,636). Accordingly, people cannot deal in risky transactions or trade, as they cannot predict or evaluate the level of risk, and the prohibition of *gharar* has been built to prevent people dealing with any business involving risk. Of course, according to this paper's view, this is not an acceptable reason to prohibit *gharar*, as many types of business, trade, or commerce involve or cannot avoid risk. Applying such an interpretation or understanding of *gharar* would stop a huge number of business transactions, and make them *haram* (prohibited).

The most important point is to establish whether *gharar* means risk and/or uncertainty. In emphasising the viewpoint of this research, there is no objection to recommending that some categories of risk, uncertainty, and speculation should be forbidden under Islamic law. The *Qur'an* mentions and clarifies that clearly, as have all the Islamic



schools, including their jurists or scholars, both early and contemporary. These categories are restricted to the meaning of gambling (*maysir* or *qimar*), which is clearly prohibited by Allah (God), who asks believers to avoid it as causing animosity and hatred between people (5:90,91). This also comes under the same understanding of the Prophet's Hadith which was narrated by Ahmad from Ibn Masoud.<sup>7</sup> In this Hadith, the Prophet prohibited the purchase of the fish while still in the sea. (Al-Shawkani, ND, p230). This prohibition is linked with satanic behaviour. In other verses, gambling is described as a sinful and harmful activity (1:219). The translation of the word "gambling" from English to Arabic becomes excessive risk or speculation with a high level of uncertainty and with no guaranteed result (Ba'albaki, 2006, p.278).

The previous discussion concerning the concept of gambling and its prohibition gives the clear view that interpreting *gharar* as risk, speculation, and uncertainty does not provide the correct perspective with which to express the meaning of the term. It would be expected that the courts would be confused in interpreting *gharar* as uncertainty or risk, which is difficult to be defined in an absolute sense. This confusion would not arise if the word *gharar* was used as it is in the *Qur'an*, that is, meaning misrepresentation or fraud, which is not acceptable under any legal system.

*Gharar* "has been translated as 'trading in risk,' or 'risk-taking.' Also used in context of being ignorant about the elements of the transaction, such as existence of the subject matter, deliverability, terms, and timing of payment" (Shah, 2007, p.10). It can be seen that almost every explanation raises some contradictions, because some writers refer to the prohibition of *gharar* as coming from the Prophet Muhammad (Arabi, 1999, p.29), which is correct, as he understood the *Qur'an* in the most proper way, but very few Muslim scholars understand his point with regard to the prohibition of *gharar*. This can be concluded from the Prophet's Hadith as he stated "do not sell what you do not own" as a firm statement to prohibit *gharar*. (An-Nawawi, 1987, p156). Very few of the Muslim scholars refer to this prohibition in the *Qur'an* in completely the wrong way, as some do not mention at all what the *Qur'an* says about *gharar*, while some claim that there is no Qur'anic

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<sup>7</sup> He is one of the closest companions to the Prophet Muhammad and he narrated many of the Hadiths (traditions) stated or exercised by the Prophet.

verses prohibiting *gharar* (Al-Saati, 2003, p.6). Of course, this gives the impression that most of the scholars who have discussed *gharar* did not focus their attention on what the *Qur'an* says about this concept, or they did not understand it properly.

### ***Gharar*, scholars' debates and controversies**

(Al-Suwailem, 2000) has summarized part of the controversies between the authors in relation to *gharar*, showing how some Muslim jurists are very much involved in causing confusion in this topic. He argues that despite the well-established legal characteristics of *gharar* under Islamic contract law, authors who are interested in Islamic finance find problems or "dilemmas" in the way of defining *gharar* to give specific meaning to this concept. In order to prove this point, he states that Zaki Badawi suggested that a specific meaning for *gharar* is uncertain, adding that *gharar* is not given a definite meaning in the Islamic law literature. This drives Muslim scholars to deal with every case separately, thereby generating different meanings for the term *gharar*. Frank Vogel expressed the same opinion; he argued that Islamic jurisprudence cannot provide a precise concept for *gharar*, which demands deeper study and articulation for the purpose of its definition (Al-Suwailem, 2000, p.61).

It is noted that some authors include the deception element as part of their definition of *gharar* (Islamic Capital Market Task Force, 2004, 7). Some others tread a closer line to the *Qur'an*, and the logical construction of *gharar*, when they include uncertainty as well as deceit as an element of *gharar*, so that the term does not only mean uncertainty (Anon, 2006, p.49). This leads to another result: *gharar* is not uncertainty or risk or ambiguity, but rather, *gharar* by its action, *taghreer*, can induce people into an unknown excessive risk or an excessive uncertainty, thus causing loss and damage to the contracting parties. This was evident when in his Hadith, the Prophet prohibited the sale of Muzabanah (exchanging dates with raisin) as sort of *gharar* (Al-Bukhari, 1987, p839). Uncertainty is not evidently established here but this transaction could be involved with some uncertainty, as well as risk. This also might be sort of a relation between *gharar* as a general term and risk, uncertainty being specific elements of it. The prohibition of this kind of sale would be related directly to any kind of misleading or defrauding the counter values of the articles sold. As can be seen in this

paper, risk itself is not impermissible. Risk is strongly accepted and expected under Islamic law within financial and commercial transactions, for the purpose of motivating people to act productively, thereby adding new value to economic activities. As mentioned earlier in this paper, a *mudarabah* contract is a very clear and desirable example that has an acceptable level of risk associated with it (Al-Suwailem, 2000, p.64).

Based on previous analysis, a similar approach can be seen when some authors interpret *gharar* to mean probable or certain deception (Ebrahim, 2007, p.6). This approach fits with the viewpoint of this paper, partly emphasising that *gharar* is prohibited, not because of risk or uncertainty, but because it contains the meaning of deception. This leads to a further point of note. The interpretation of *gharar* as uncertainty could be understood to mean uncertainty about the existence of deception in the contract. In other words, the prohibition of *gharar* as being probable deception means that *gharar* is considered to be misrepresentation, because misrepresentation and deception have the same concepts in the Islamic-Arabic term. Under Islamic contract law, parties are encouraged to avoid entering a contract if they have doubts about the existence of misrepresentation. To simplify the discussion, understanding the logic of Islamic economics leads one to say that it is impossible to banish all types of risk, as no business or human activity is without risk, including the issue of making a profit. This issue can be associated with the expectation from some contracting parties of disappointing results, as the issues of gain and loss are key elements in commerce. The significant changes in prices of some goods from one day to another are a good example of this (Abdelwahab, 2007, p.97).

It has to be noted that the most direct and clear definition of *gharar* as translated from Arabic to English states that “*gharar* is deceptive misrepresentation and usage of misleading means” (Abdul-Rahman, 2007, p.1). This is what would be found in the *Hasah* sale which was also prohibited by the Prophet’s Hadith as sort of *gharar* (Al-Tirmidhi, ND, p532). In this sale one party throws a stone towards items and the one touched by the stone will be the item sold and the buyer has to accept it in the pre-agreed price. This is more likely to contain uncertainty and some kind of risk when intending to establish a deal or transaction. It is useful to know that one of the reasons for misunderstanding *gharar*, and many other Islamic terms or concepts, is

due to incorrect translation from Arabic to English by authors who write about Islamic legal and financial terms. This issue becomes more serious when this is caused by renowned Muslim scholars who do not understand the Arabic language fluently, which results in altered meanings of concepts from their original and intended purposes (Ebrahim, 2007, p.3).

As a result, a lack of knowledge of the Arabic language and its context has caused clear and serious misunderstandings with regards to the impermissibility of *gharar* in the *Qur'an*. The *Qur'an* deals clearly and directly with the concept of *gharar*, its derivative terms and verbs, and clarifies how important it is to be avoided. Based on this analysis, it is much easier for people to understand and appreciate why *gharar* is absolutely not allowed under Islamic contract law, as one of the most moral and ethical demands of all transactions between people.

It should be remembered that a large part of early trade and commerce between Muslims and other nations was continental trade. The situations and conditions of this trade held risks, which included uncertain results. Therefore, it would not be possible or imaginable that the *Qur'an* and the Prophet would prevent Muslims from practising trade across the desert because it was risky or uncertain. Otherwise, early Muslims would have had to stop work, because most of their economic and financial system was built on trade. As mentioned earlier, considering *gharar* to mean risk or uncertainty would contradict one of the most famous Islamic contracts (*mudarabah*), which is mentioned in the *Qur'an* as a type of work that involves travel comprising of risk and uncertainty (73:20).

It can be imagined the level of risk that the early Muslim traders experienced at that time, without the modern facilities now available. Some may wonder if all categories or types of risk, speculation, and uncertainty are forbidden under Islamic law, or whether some are allowed. The answer is found in what has already been discussed; issues such as excessive risk, speculation, and uncertainty are dealt with under the concept of gambling (*maysir*), which is the way for some people to make money easily, without any effort, at no risk, and is also the way for others to lose money without working, and through excessive risk. Doing business in this way would contradict the concept of productivity,

which is one of the most important factors to keep an economy healthy. Risk, speculation, and uncertainty are acceptable as they are far away from gambling, which is an extreme level of risk and uncertainty.

The *Ottoman Journal of Equity* organizes the rules of *taghreer* in the context of fraud (*khida'a*) in relation to trade contracts (selling and buying) (Manthour, n.d., p.3211). As explained earlier, *taghreer* is the action of *gharar*, which is misrepresentation. There is another perspective that supports the meaning of *taghreer* as misrepresentation and misrepresentation as fraud (*tadlees*, *khida'a*). This possibility comes under the title of *khiyar al-tadlees* or *khiyar al-taghreer*, as a fraud option where “the disappointed party” would have the right to rescind the contract if they can prove that they entered into that contract on the basis of “deceit or intentional misrepresentation by the other contracting party” (Hasan, 1994, p.59). This supports the idea that *taghreer* (*gharar*), *tadlees*, deceit, and misrepresentation bear the same meaning under Islamic contract law, as demonstrated in this paper.

## Conclusion

As has been seen, the Arabic-Arabic translation does not distinguish between misrepresentation and fraud and similar words such as cheating, deceit, lying, and so on. In this context, *gharar* cannot be merely considered as risk or uncertainty, although they are both part of its elements. It should be noted that *gharar* will be applicable when one of the contracting parties tries to change facts, or does not give correct information (or give false information) related to the risk or uncertainty involved, convincing the other party that there is no uncertainty or the level of risk is very low, when in reality it is very high or excessive. Based on that, if a party induced the other to enter into a contract by providing a misleading evaluation, this would be considered *gharar* (misrepresentation, fraud or any parallel term). The legal effects of *gharar* would depend on the facts of the case, and these could make a contract void or voidable. This is because *gharar* is connected to fraud, or at least involved in fraud, which is one of the main reasons behind its prohibition. The reference to fraud here is based on the understanding that the contract involves fraud, involves an attempt to obtain property or money from another without having the legal right to do so (Hasan, 1994, p.41) which is strictly prohibited (*haram*) under Islamic law. This issue requires further research by contemporary Muslim scholars in

order to properly classify the categories of *gharar*, and their legal effects with regards to contracts.

Under Islamic contract rules, *gharar* carries the meaning of misrepresentation, fraud, deceit, and similar terms. This, of course, contradicts most of Islamic jurisprudence and scholars' writings, which deal with *gharar* in a way far from the Qur'anic context. The mission of the jurists or scholars should be to derive and organize rules of *gharar* as misrepresentation, fraud, uncertainty, *jahalah*, *ghabn*, *tadlis* and so on, in order to draw a clear line between *gharar* and its similarities with other terms and introduce a unified understanding to the concept of *gharar*. This is also the case when it comes to redefine the relation between *gharar* as a wide general concept and other terms as specific and elements of *gharar*. The same applies to the English-Arabic translation and vice versa. This is very much needed, in order to bring an end to the confusion and contradictions with and between the non-Arabic speakers who are interested in Islamic contract law. It is also needed urgently, due to the notable emergence of Islamic financial contracts at an international level. A modernized understanding of the concepts underlying contracts is needed, in order to meet contemporary commercial demands while still complying with the Qur'anic teachings.

*Gharar* attracts a lot of interest and instigates wide-ranging discussions by writers on Islamic financial and commercial contracts. It is noted, however, that most of these writers have not paid enough attention to the general meanings derived from the *Qur'an*. Very few of them, when they did so, did not go directly to the verses that explain *gharar* and its derivative terms. It is also worth noting that those who have written about this subject, did not investigate the practical Arabic meaning of *gharar*, following respected Arabic linguistics and dictionaries. However, scholars and writers have to do so, as this would help to enhance and strengthen the knowledge and understanding of the realistic Islamic approach to Qur'anic teachings. Finally, *gharar* could be comparable to the concept of misrepresentation, fraud, or fraudulent misrepresentation under English contract law, but not limited to it. It can also be understood that *gharar* is a wide meaning that affect the transactions or contracts with uncertainty or risk being part of its elements.

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## **Predicting the Probability of Financial Crisis in Emerging Countries Using an Early Warning System: Artificial Neural Network**

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Tamat Sarmdi

The first upsurge of rising economies in the world took place in early 2000s in Brazil, Russia, India, and China, which are known as BRIC countries. Since then, these countries have demonstrated great investment opportunities for financial services as well as the other real sectors' services. Last decades have witnessed frequent financial disruptions in different kinds which resulted in ruining the economy with unwanted social consequences in BRIC as well as the other countries. The destructive consequences of crisis explain the major reasons for estimating the predicted probability of the crisis. This paper studies the factors associated with the emergence of financial crisis in BRIC countries during 1992-2011 using an Artificial Neural Network. In this context, we built, trained, and tested an Early Warning System (EWS) in order to find out the importance of different inputs in explaining the crisis. So-called model has proven itself by predicting the crisis and non-crisis dates very well. Comparing the importance and significance of all variables in the model, it was discovered that the domestic credit to private sector (% of GDP, domestic credit growth), Inflation, freedom, interest rate and economic growth were the most significant variables in this model, while the deposit insurance rate was found to be the least significant variable in explaining the crisis.

### **1. Introduction**

There have always been constant fluctuations in the volume of economic activities. The financial crisis, a type of economic fluctuation, has been the focus of interest for the economists due to multi-dimensional problems it causes. Financial crisis refers to the

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efficiency loss in financial markets and also imbalance in the financial sector. To define broadly, the sudden and strong changes occurring in price and quantity of financial instruments such as foreign exchanges, stocks, promissory notes, and the bills of exchange are called financial crisis since such changes disrupt the efficiency of financial markets. Foreseeing the financial crises and taking precautions to minimize the length and impacts of the erupted ones are of great importance. Many financial crisis models and theories have been developed to guide the institutions which aim to achieve the goals in question.

The early 2000s witnessed the first wave of rising economies in the world: Brazil, Russia, India and China (BRIC), are also known as first generation of emerging markets. These countries has relatively higher growth rate in both financial and real sectors than the developed nations as well as other developing countries. Financial crises have been threats for these countries trying to meet the requirements of advancements as they distract plans and resources from leading to realizing goals. Therefore, with the introduction of these crises, the motive to gain a better understanding of the probability of emerging financial crisis and the factors explaining such crisis have led to a rapid growth in literature focusing on predicting financial crisis.

The primary purpose of EWS is to detect vulnerabilities that moves an economy towards a crisis, so that preventive policies can be implemented (IMF, working paper, 2010). Hence, such an early warning system is considered as a crucial part of integrated measures taken by authorities to prevent financial crises and facilitate financial stability (Haxhi & Aguilera, 2012). Beginning with the 90s, international organizations started to develop Early Warning System (EWS) models to determine the factors leading the financial crisis. To date, although many investigators dealt with the factors in predicting the crisis, to our knowledge, there has been no specific study on factors explaining the crisis in these countries.

Generally, there have been four perspectives helping the crisis prediction. The first approach belongs to a fundamentalist who emphasized the mismanagement of macro-economy; and the second one to internationalists, who focuses on the international financial markets' inherent volatility, sentiment, self-fulfilling, speculative attack, and contagion. And the third approach is for new fundamentalists, who

underlined regulatory and structural problem, particularly in the financial sector. A fourth approach belongs to the technicalist who mostly focused on the technical finance theory. However, to date, there has been no attempt to make a multilateral perspective for elements or concepts that can help understanding the factors explaining the crisis. Another notable contribution to this paper shows the importance of Freedom index, the index of business freedom, trade freedom, and fiscal freedom, government spending monetary freedom, investment freedom, financial freedom, and property rights.

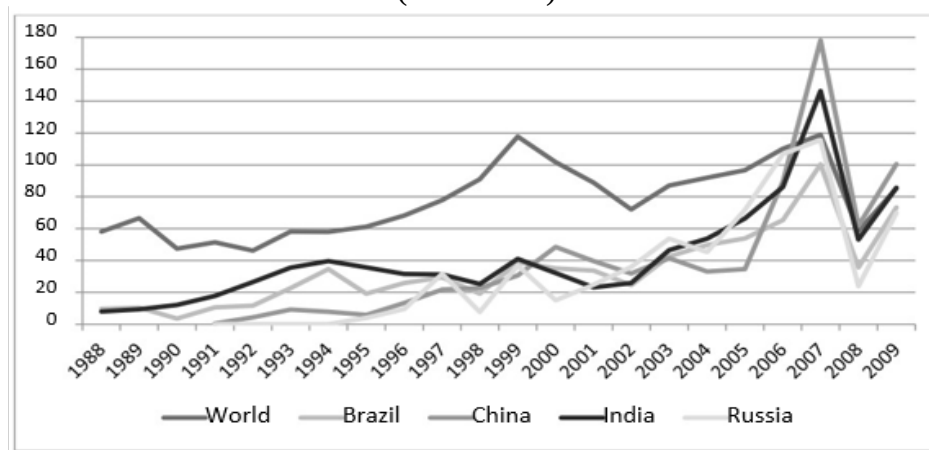
Understanding the importance of factors explaining the crisis helps managers and policymakers adopt preventive strategies against negative repercussions. In this study, the determinants of financial crisis in BRIC countries, from 1992 to 2011, are investigated empirically by making use of the method of Artificial Neural Networks (ANN). This paper hypothesizes that Artificial Neural Network (ANN) along with the index of freedom and the variable of deposit insurance improves the predictability of EWS. The remaining paper is organized in the following sections; Section 2 provides a stylized fact about BRIC countries, Section 3 presents the literature review, Section 4 discusses the empirical results, and section 5 incorporates brief conclusions.

## **2. Stylised fact about BRIC countries**

Over the past few years, rise of emerging markets has been one of the biggest events in the world of investment. Compared to the developed markets, these countries continue to grow at a higher rate in terms of GDP per capita (Based on WDI indicators). Financial sector as a part of economy is also growing more than the World on average. One of the most important indicators for measuring the financial development is market capitalization over GDP. If this ratio increases, it means financial market and especially stock market in this economy will become more developed. The trend of market capitalization over GDP in BRIC is depicted in figure 1, as shown in this figure, although this ratio was significantly smaller than the average of the world for a quite long period of time, this ratio had an increasing trend in BRIC countries to the stage that so-called ratio in China and India exceeded the average level of the world in 2007 and thereafter. This trend

indicates that investment in BRIC economics is becoming more attractive.

**Figure 1.1:** Trend of market capitalization over GDP in BRICs (1988-2009)



Source: World Development Indicator, World Bank (2011)

Chinese and Indian economies demonstrated an annual growth of 10.0% and 6.5%, respectively, in terms of GDP since 1990 to 2011. By comparison, The World on average grew on an average annual rate of 2.7%; OECD countries grew on an average annual rate of 2%, over the same period. With this rate of growth, Chinese economy witnesses a double growth every seven years and Indian economy observes a double growth every 11 years. As emerging economies tend to grow, they will depict a larger influence over the global economy. Cheng, (2007) estimated that emerging economies will stand for 50% of global GDP by 2050.

### 3. Literature Review

In this section, different types of financial crisis; different views on factors explaining crisis; and Econometric approaches to identify the determinants of financial crisis are discussed.

#### 3.1. Different Types of Financial Crisis

To date, many studies have been conducted to explain the reasons behind financial crisis that erupted in different regions. The literature

generally covers three types of crises: currency crises, banking crises, and sudden stop crisis.

### *Currency crisis*

The first generation of currency crisis model focuses on the fundamental disequilibrium such as budget deficit, decreasing reserves and growth rate of money supply as a cause of the currency crises (Krugman, 1979). The second generation model shows that a speculative attack could be self-fulfilling if a government is in the vulnerable zone fundamentally unpredictable and therefore anticipating crises is extremely difficult (Kaminsky, 1999).

According to the IMF (1998), a currency crisis occurs when a speculative attack on a currency results in a devaluation (or sharp depreciation) of the currency, or forces the authorities to defend the currency by expanding large volumes of international reserves or by sharply raising interest rates. A currency crisis is defined as a situation in which an attack on the currency leads to its sharp depreciation, a large decline in international reserves, or a combination of the two.

### *Banking crisis*

A banking crisis is a situation in which an actual or potential bank runs or failures induce banks to suspend the internal convertibility of their liabilities or which compels the government to intervene to prevent this by extending assistance on a large scale (IMF, 1998). Literature on banking crises focuses on theory of bank runs and bank insolvency (Ivashina, V., David Scharfstein, D., 2010).

In terms of indicators of banking crises, some studies also use EWS models to assess the potential indicators. Goldstein, (2000) studies a sample of 87 currency crises and 29 banking crises that occurred in 25 emerging market economies and smaller industrial countries over 1970-1995, following the work by Kaminsky, (1999), the signal approach is used to analyse the performance of indicators of currency and banking crises, nine other indicators are added to the existing 15 indicators in Kaminsky, (1999).

In terms of indicators of banking crises, there are indicators such as the current account balance, short term capital inflows, foreign direct investment, the overall budget deficits, general government consumption, central bank credit to the public sector and net credit to the public sector.

The first four indicators are expressed as a share of GDP, their finding suggest that, among the banking crisis indicators, the best performing indicators are appreciation of the real exchange rate, a decline in stock prices, a fall in exports, a rise in the M2 multiplier, a fall in output, a rise in real interest rate on bank deposit, a high ratio of short term capital inflows to GDP, and a ratio of current account deficit to investment.

#### *Sudden stop crisis*

The currency and banking crisis models focus on macroeconomic policy. However, recent crises in emerging market economies have drawn attention to problems in financial sector and the behaviour of international capital markets. Chang & Velasco, (2000) emphasize the role of financial sector fragility in association with international illiquidity in causing crises. Many crisis-hit countries suffered from liquidity problems. They had high short term debt especially external debt relative to liquid problems. They had high short term debt especially external debt relative to liquid assets or international reserves, and therefor were extremely vulnerable to a reversal capital inflows or sudden stops.

Calvo, (2002) explains that being closed implies a sharp increase in the real exchange rate (depreciation) following the sudden stop. Sharp increases in the real exchange rate deteriorate highly dollarized balance sheets of both public and private sector since highly dollarized liabilities imply larger currency mismatches when the real exchange rate rises. The findings highlight the importance of balance sheet effect in causing sudden stop.

### **3.2 Different views on factors explaining crisis**

Generally, there are four views about the factors which are affecting or making structure of return. First view belongs to fundamentalist who emphasized macroeconomic factors such as interest rates, money

supply, exchange rates, oil and stock prices, inflation, gold price, industrial production, and foreign portfolio investment. The view which focuses on the inherent volatility of international financial markets, sentiment, self-fulfilling speculative attack, and contagion belongs to Internationalist. New fundamentalist emphasize on underlining regulatory and structural problems, particularly in financial sector. The Technicalists are more focused on the technical finance theory. The basic principle of technical analysis is that market price reflects all relevant information. There are two types of investors: news watchers or informed investors and technical or noise traders who use immediate past price information to make investment decisions. Technical analysis uses past price and volume information to forecast the direction of the market. Technical analysts, sometimes called "chartists", may employ models and trading rules based on price and volume transformations, such as the relative strength index, moving averages, regressions, inter market and intra-market price correlations, cycles ,or classically, through recognition of chart patterns.

### **3.3. Econometric approaches to identify the determinants of financial crisis**

There are generally four types of financial analysis and models to develop an Early Warning System. This include :I) structural model, II) Signal approach, III) pooled panel data such as Logit and Probit models, and IV), Artificial intelligence machine learning methods. Among the family of first three approaches, logistic analysis has been widely used for previous crisis prediction studies ,but its reliability is questionable when the assumptions associated with probability models, such as a specific function relationship between dependent variables and independent variables; do not hold (Luther, 1998) and (Zhang, Y. Hu, Eddy Patuwo, & C. Indro,1999). However, ANNs are a promising alternative tool because, in most cases, it is robust and able to adapt itself to the given conditions in order to learn the relationships (Denton, 1990). The most important difference between the ANN and regression models is the method in which the values for the weights are established. ANNs employ a dynamic programming approach to iteratively adjust the weights until the error is minimized while the regression models compute the weights using a mathematical technique

that minimizes the squared error. There is no standard rule for choosing of neural network topology in different types, including Multilayer Perception, Modular Network, Jordan/Elman Network, Time-Lag Recurrent Network, and etc. The most common neural network model is the multilayer perception, or perceptron (MLP).

ANN includes input variables (predictors), output variable (crisis dummy), and training algorithm. The process is implemented in three stages, the first-stage (model-building) with 70 percent of data, the second-stage (training and validation) with 15 percent of data, and the third-stage (testing) with 15 percent of data. Following the model-building stage based on the previous literature and the contribution of this paper, the learning stage will be conducted to train the network using Levenberg-Marquardt (TrainLM) optimization. TrainLM is usually the fastest backpropagation algorithm which updates weights, iteratively. Subsequently, each iteration will be evaluated by the validation data. The testing stage will be performed to ensure the generality of the learned model in terms of new data. The applied software (Matlab, SPSS) will produce a number of statistical information at the end of the training, validation, and test stage, which will determine the characteristics of our model.

While the probability of crises is estimated using ANN, the relative importance of each input (predictor) is also analysed in ANN. Particularly, this study proceeds with analysing the importance of predictors in determining the neural network. The analysis is conducted by using both training and testing samples to create a table demonstrating the relative importance and normalized importance for each predictor. Normalized importance is the ratio of the importance values to the largest importance values as reported in percentages.

#### **4. Empirical Analysis**

In this study, crisis considered as the dependent variable. It takes the value one for the first year of the financial crisis and zero otherwise. Financial crisis is considered if two of the following conditions are met: I), significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations); II) significant banking policy intervention measures in response to significant losses in the banking system. We consider the

first year that both criteria are met to be the year when the crisis occurs. We consider policy interventions in the banking sector to be significant if at least three out of the following seven measures have been used: I) extensive liquidity support; II), 5 percent of deposits and liabilities to non-residents); III), bank restructuring gross costs (at least 3 percent of GDP); IV), significant bank nationalizations; V), significant guarantees take place; VI), significant asset purchases (at least 5 percent of GDP); and vii), deposit freezes and/or bank holidays. The period covered is 1992-2011, with 4 countries, including Brazil, India, Russia, and China; and up to 12 crisis occurrences in the sample.

In this analysis, we want to explain the crisis index “crisis” by a set of independent variables (See Table 1). Many studies choose between the following set of indicators. In this study we followed Neal and Davis, (2005) in choosing the explained variables. However, we added the extra variables as highlighted with a star letter in Table 1. We took the exogenous variable “FDI over GDP” from Demirgüç-Kunt, Detragiache, & Romero, (1997), Demirguc\_kunt, (2005) while we added the other variable (Freedom) which is one of the contributions of our study. It is an index of business freedom, trade freedom, fiscal freedom, government spending monetary freedom, investment freedom, financial freedom, property rights freedom from corruption, and labour freedom. We used annual data covering the period from 1992 to 2011. All the data are obtained from the World Development Indicators (WDI) except for “Crisis” and “Freedom” indices. “Freedom” index is taken from the heritage foundation while the data on crisis is taken from Laeven & Valencia, (2013).



**Table 1:** Independent variables

| Variable name | Definition                                                                                                                                                                                        | Source                  |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| GDP growth    | Rate of growth of real GDP                                                                                                                                                                        | WDI                     |
| TOT change    | Change in the terms of trade                                                                                                                                                                      | WDI                     |
| Real interest | Nominal interest rate minus the contemporaneous rate of inflation                                                                                                                                 | WDI                     |
| Inflation     | Rate of change of GDP deflator                                                                                                                                                                    | WDI                     |
| M2/Reserves   | Ratio of M2 to international reserves                                                                                                                                                             | WDI                     |
| Credit growth | Rate of growth of real domestic credit to the private sector                                                                                                                                      | WDI                     |
| P-Credit /GDP | Ratio of private credit to GDP                                                                                                                                                                    | WDI                     |
| GDP/CAP       | Real GDP per capita                                                                                                                                                                               | WDI                     |
| Deposit-ins   | Dummy that equals one if the country has explicit deposit insurance (including blanket guarantees) and zero otherwise for                                                                         | WDI                     |
| *FDI/GDP      | Foreign direct investment over GDP                                                                                                                                                                | WDI                     |
| *Freedom      | The index of business freedom, trade freedom, fiscal freedom, government spending monetary freedom, Investment freedom, financial freedom, property rights freedom from corruption, labor freedom | The heritage foundation |

In order to estimate the probability of a crisis, the most common neural network known as multilayer perception or perceptron (MLP) is employed. We go through three stages while modelling the artificial neural network. The model is built in the first stage, trained in the second stage and tested in the third stage.

Table 2 tabulates the actual results versus predicted probability of crisis by the Back Propagation looking forward ANN approach, for the period from 1992 to 2011 in BRIC's countries. The results show how successfully the net learnt the relationship and predicted the actual output values. In the table below are the actual and predicted values of the output, crisis. As seen, the model predicted the actual values of pressure index at crisis dates very closely. On the other hand, the values of the crisis index at non-crisis dates are also predicted very closely to actual values of crisis index. Therefore, we could infer that the model learnt and predicted the crisis and non-crisis dates very well.

**Table 2:** Actual versus predicted results of trained net

| Country | Time | Predict  | Actual |
|---------|------|----------|--------|
| Brazil  | 1992 | NaN      | 0      |
|         | 1993 | NaN      | 1      |
|         | 1994 | NaN      | 1      |
|         | 1995 | 1.00E+00 | 1      |
|         | 1996 | 1.00E+00 | 1      |
|         | 1997 | 9.97E-01 | 1      |
|         | 1998 | 5.17E-03 | 0      |
|         | 1999 | 7.53E-06 | 0      |
|         | 2000 | 6.11E-06 | 0      |
|         | 2001 | 1.05E-09 | 0      |
|         | 2002 | 1.58E-10 | 0      |
|         | 2003 | 8.44E-15 | 0      |
|         | 2004 | 1.67E-16 | 0      |
|         | 2005 | 0.00E+00 | 0      |
|         | 2006 | 2.55E-15 | 0      |
|         | 2007 | 2.70E-04 | 0      |
|         | 2008 | 3.65E-07 | 0      |
|         | 2009 | 1.11E-09 | 0      |
|         | 2010 | 2.25E-10 | 0      |
|         | 2011 | 1.29E-04 | 0      |
| China   | 1992 | NaN      | 0      |
|         | 1993 | NaN      | 0      |
|         | 1994 | NaN      | 0      |
|         | 1995 | 1.71E-05 | 0      |
|         | 1996 | 2.92E-02 | 0      |
|         | 1997 | 9.88E-01 | 1      |
|         | 1998 | 1.47E-02 | 0      |
|         | 1999 | 6.82E-10 | 0      |
|         | 2000 | 1.51E-12 | 0      |
|         | 2001 | 3.54E-11 | 0      |
|         | 2002 | 5.05E-10 | 0      |
|         | 2003 | 5.00E-11 | 0      |
|         | 2004 | 7.02E-12 | 0      |
|         | 2005 | 2.24E-03 | 0      |
|         | 2006 | 1.87E-03 | 0      |
|         | 2007 | 2.05E-04 | 0      |
|         | 2008 | 5.60E-10 | 0      |
|         | 2009 | 9.76E-10 | 0      |
|         | 2010 | 2.38E-06 | 0      |
|         | 2011 | 1.25E-09 | 0      |

**Table 2:** Continued: Actual versus predicted results of trained net

| Country | Time | Predict  | Actual |
|---------|------|----------|--------|
| India   | 1992 | NaN      | 1      |
|         | 1993 | NaN      | 0      |
|         | 1994 | NaN      | 0      |
|         | 1995 | 1.72E-15 | 0      |
|         | 1996 | 1.17E-15 | 0      |
|         | 1997 | 8.33E-16 | 0      |
|         | 1998 | 2.33E-15 | 0      |
|         | 1999 | 2.05E-15 | 0      |
|         | 2000 | 2.16E-15 | 0      |
|         | 2001 | 3.76E-14 | 0      |
|         | 2002 | 9.21E-15 | 0      |
|         | 2003 | 5.50E-15 | 0      |
|         | 2004 | 1.50E-15 | 0      |
|         | 2005 | 2.05E-15 | 0      |
|         | 2006 | 1.39E-13 | 0      |
|         | 2007 | 3.16E-13 | 0      |
|         | 2008 | 1.51E-05 | 0      |
|         | 2009 | 6.97E-10 | 0      |
|         | 2010 | 8.33E-15 | 0      |
|         | 2011 | 4.40E-14 | 0      |
| Russia  | 1992 | NaN      | 0      |
|         | 1993 | NaN      | 0      |
|         | 1994 | NaN      | 0      |
|         | 1995 | 1.26E-03 | 0      |
|         | 1996 | 3.86E-03 | 0      |
|         | 1997 | 9.94E-01 | 1      |
|         | 1998 | 1.41E-03 | 0      |
|         | 1999 | 2.79E-09 | 0      |
|         | 2000 | 3.86E-12 | 0      |
|         | 2001 | 2.47E-12 | 0      |
|         | 2002 | 7.40E-11 | 0      |
|         | 2003 | 2.54E-08 | 0      |
|         | 2004 | 1.91E-09 | 0      |
|         | 2005 | 8.35E-11 | 0      |
|         | 2006 | 1.79E-06 | 0      |
|         | 2007 | 9.97E-01 | 1      |
|         | 2008 | 1.00E+00 | 1      |
|         | 2009 | 1.00E+00 | 1      |
|         | 2010 | 9.99E-01 | 1      |
|         | 2011 | 2.17E-06 | 0      |

Note: Not A Number (NaN) cells referred to not applicable cells. NaN refers to the unpredicted probability of crisis due to missing values in the variable of Freedom.

The relative importance of inputs is an indicator of how significant each of the inputs in the predictive model is. The values of this parameter range from 0 to 1. Higher values are associated with more important inputs. If the importance value of input is zero, that input considered useless and might be omitted. We should pay attention to the following warnings while evaluating the importance values of the inputs. Firstly, we cannot assume that input 1 is twice as good as input 2, i.e., if the importance value of input 1 is 0.2 and the importance value of input 2 is 0.1. All we can say with confidence is that input 1 is more important than input 2. Secondly, the sum of the importance values of all inputs is approximately 1. Therefore, these importance values may be thought of as the percent contribution to the model of each variable. The importance of each variable in the predictive model is shown by table as follows:

**Table 3:** Relative importance of inputs

| Variables                                    | Importance | Normalized Importance |
|----------------------------------------------|------------|-----------------------|
| Domestic credit to private sector (% Of GDP) | .104       | 100.0%                |
| Fiscal surplus (deficit)                     | .083       | 80.6%                 |
| GDP growth (%)                               | .090       | 87.3%                 |
| GDP per capita real (growth %)               | .081       | 78.0%                 |
| Change of trade                              | .070       | 67.9%                 |
| Real interest rate                           | .092       | 88.9%                 |
| Inflation (growth of GDP deflator)           | .098       | 94.8%                 |
| Domestic credit (growth)                     | .099       | 95.7%                 |
| Deposit insurance                            | .017       | 16.3%                 |
| Freedom                                      | .093       | 89.6%                 |
| FDI/GDP%                                     | .087       | 83.8%                 |
| M2/International reserve                     | .085       | 82.5%                 |

Source: Author's Estimate

As can be observed from the table, the most important input in predicting the output is the input of Domestic credit to private sector (% Of GDP) because its value of importance is the greatest. On the other hand, the input which is the least important in predicting the output is the input of Deposit insurance since its value of importance is the smallest of all.

## 5. Concluding Remarks

This global economic and financial instability in 1990s and 2000s had a widespread effect on the world economy and especially on some countries such as BRIC's countries which are more investment-attractive. These crises led to a large discussion on the theoretical aspect of the crisis models, and also influenced on empirical analyses that aimed at identifying the leading variables explaining the crisis. Prediction of recession is an important task because policymakers would like to anticipate future recessions so that they have enough time for remedial policy actions to oppose them. In our study, for the period covering 1992 to 2011, financial crises that erupted in BRIC's countries analysed by making use of the method of Artificial Neural Network (ANN) . For this purpose an ANN model is built, trained and tested to provide predictions for the probability of financial crises and to find out major factors explaining the probability of crisis. As a result, we have a better understanding of how the probability of occurring financial crisis influenced by a host of factors, including change in the term of trade, real interest rate, inflation, ratio of M2 to international reserves, credit growth, ratio of private credit to GDP, real GDP per capita, insurance deposit, the ratio of foreign direct investment over GDP, and freedom. Comparing the actual and predicting probability of crisis, we could infer that the model learnt and predicted the crisis and non-crisis dates very well. Further, considering the importance and significance of all variables in the model, it is demonstrated that the variable of Insurance Deposit rate was the least significant variable, while the variable of domestic credit to private sector (% Of GDP) was found out to be the most significant variable in the model. Further studies are warranted to predict the recession using the built model in this study.

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## **Malaysian Banking Sector Efficiency, Structural Breaks and Cross-Sectional Dependence: Empirical Evidence**

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This paper examines the weak-form market efficiency of the Malaysian commercial banks over the period of 17 October 1994 to 23 May 2014. We apply a powerful panel stationarity tests proposed by Carrión-i-Silvestre et al. (2005) that allow for the presence of multiple structural breaks and exploit the cross-section variation of the bank prices series. Our results indicate that all series can be characterized by a random walk process suggesting the bank stocks are weak-form efficient. We also find the evidence showing the presence of structural breaks and cross-sectional dependence (CSD) in the series. The results suggest that ignoring structural breaks and CSD can lead to biased estimates and spurious inference. The overall finding of this study is in favour of the weak-form efficiency. This finding has salient implications in terms of capital allocation, stock price predictability, forecasting technique, and the impact of shocks to stock prices.

### **Introduction**

Investors in the stock market have a tendency to invest for short-horizon (over periods of days, weeks, or months) as well as to speculate, instead of simply buy-and-hold regularly or invest for long-horizon. Moreover, some analysts view the stock markets in developing countries as casinos that have little impact on economic growth (Levine 1996:7). In fact, the market which is largely occupied by short-horizon investors is exposed to the higher risk of capital inflow reversal. Radelet and Sachs (1998) reveal that Malaysia is amongst the Asian countries that has experienced the tremendous adverse impact from Asian financial crisis through the

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withdrawals of foreign capitals aftermath to the crisis. In particular, technical analysis hints that stock prices or returns are somewhat predictable. Technical analysts perceive a stock series will enrol in trends and these trends tend to repeat in future (see Dana and Cristina 2013). The tenet of chartist or technical theories is the assumption that historical stock price behaviour tends to recur in future, hence successive price changes are dependent and can predict the future movements of stock prices (Fama 1965). One famous technical theory is the Dow Theory. According to Ray (2012), Dow Theory holds that there are three main components in the movement of stock prices, namely, the primary trend or long-term trend which provides the grounds for bull and bear markets, the secondary trend which shows temporary reversal in the primary trend, and the daily fluctuations in stock prices are perceived meaningless. On the other hand, the weak-form efficient market hypothesis (EMH) is the assertion that stock prices fully reflect the information contained in the history of past trading (Bodie *et al.* 2008). This is consistent with the theory of random walks which states that stock price changes would have no memory and cannot predict the future movements of prices in a meaningful way (Fama 1965).

Mostly the past studies of weak-form EMH in the context of Malaysia are prominence to the stock market efficiency at the aggregate level by using the data of FTSE Bursa Malaysia KLCI (FBMVKLCI) index prices, for examples, Lim *et al.* (2005), Lim (2008), and Munir and Kasim (2009). Firm-level disaggregation is crucial to pinpoint the efficiency and inefficiency for individual stocks. However, there are only a handful of past studies that focus on bank stocks in Malaysia. One example is the study of Lim (2007) which concentrates on four selected bank stocks. Several other past studies have employed the data envelopment analysis (DEA) method to study the relationship between technical efficiency and bank stock returns, including Habibullah *et al.* (2005), Sufian (2006), Sufian and Majid (2007), and Sufian and Haron (2009). Nevertheless, these studies are more towards the semi-strong form EMH. Currently, the current literature cannot provide a clear consensus on this matter. Bank stocks efficiency is more predominant compared to the stocks from other sectors. Banks act as the traditional financial intermediaries that match the borrowers and savers in an economy. They play an important role in allocating capital among all the productive real sectors. Levine and Zervos (1998) provide evidence showing bank credit predicts the growth in output, capital stock, and productivity. FitzGerald

(2006) claims that banks have remained as the key element in the financial system, especially when we consider most of the non-bank financial intermediaries are owned by banks. Moreover, the role of banks is extended to asset management and fee-based services.

The EMH is widely known for having pivotal implications in terms of resource allocation, the predictability of stock prices, trading strategy, forecasting techniques, and the effect of shocks to stock prices. First, from the standpoint of policy makers, efficiency is essential for enabling an effective allocation of capital among the productive real sectors through the stock market. When the market is efficient, share prices provide accurate signals to guide the investment decision-makings of all market participants, including firms and households. Efficiency is an incentive for investing in the stock market because investors are convinced that they can trade shares at a fair value. Thus, an efficient market can attract more investments and potentially contribute in fostering a more rapid economic growth. Otherwise, an economy can suffer the costs of inefficiency in the stock market. These costs are such as higher information costs and excessive share price fluctuations (Hubbard 2008). Second, the implication of the EMH is the unpredictability of stock prices. According to Fama (1965), competition in the market causes the full effect of new information is reflected instantaneously by the actual stock prices. The immediate stock price adjustment implies that successive price changes of stocks will be independent. Thus, an efficient market is similar to a random walk market, in which the theory of random walks posits that stock price series has no memory and historical stock prices cannot forecast the future in a meaningful way. In particular, the weak-form EMH asserts that stock prices already fully reflect the information contained in the history of past trading (Bodie *et al.* 2008), thus the information of historical prices cannot predict the future prices. Third, the EMH has an implication on trading strategies. It implies that speculation is risky and it is wiser to adopt a simply always buy-and-hold policy. Technical analysis is ineffective under the weak-form EMH because stock prices fully reflect the information of past trading. Fourth, if the series of stock prices can be characterized by random walks, then the effect of shocks on the prices is permanent. That means the prices will reach a new equilibrium and the future prices cannot be forecasted based on the past movements in prices (Narayan and Smyth 2004; Narayan and Narayan

2007; Munir *et al.* 2012). On the contrary, if stock prices are mean reverting shocks to the prices will have a temporary or transitory effect.

Specifically, the aim of this study is to examine the data generating process for the stock prices series of all commercial banks currently listed at the Malaysian stock exchange over the period of 17 October 1994 to 23 May 2014, in order to gauge the weak-form market efficiency for the Malaysian banking sector. We employ an array of unit root tests, including univariate and panel unit root tests, and the panel stationarity tests proposed by Carrión-i-Silvestre *et al.* (2005) which allows for the presence of multiple structural breaks and exploit the cross-section variation of the stock prices series. According to Baltagi (2001), panel data analysis allow for heterogeneity in individual, firms, regions and countries, which is absent when using aggregated time series data. We simultaneously consider structural breaks and CSD which have not received much attention in previous panel based studies of the EMH in the context of Malaysia. The Malaysian bank stocks are evidently affected by the Asian financial crisis. Most of the bank stock prices series exhibit major dips during the crisis period, 1997-1998 (as depicted in Figure 1 in Appendix A). In addition, Lim (2008) has provided evidence showing the efficiency of Malaysian finance sector has significantly declined during the crisis, 2 July 1997-31 August 1998. It is possible that there are other extreme events which have caused structural breaks in the series. Meantime, there are strong reasons to believe that CSD exists among the selected commercial banks. Firstly, commercial banks are highly interconnected in the domestic financial system. Secondly, as revealed by International Monetary Fund (IMF) (2014), in Malaysia, banks, non-bank financial institutions, and mutual funds are linked through the domestic wholesale funding market. From the empirical perspective, unit root test that does not take account of structural break will have low power (Perron 1989). Meanwhile, ignoring CSD can lead to biased estimates and spurious inference (Chudik *et al.* 2009). Therefore, our analysis incorporates structural breaks and CSD.

The rest of this paper is organized as follows: Section 2 provides a brief review of the empirical literature. Section 3 describes the dataset and presents the methodology. Section 4 is the summary and conclusion.

## 1. Literature Review

The weak-form EMH literature in the context of Malaysia is prominence to the efficiency of stock market at the aggregate level (Lim *et al.*, 2005, Munir and Mansur, 2009, and Lim, 2008 among others). Lim *et al.* (2005) examine the data generating process of Kuala Lumpur Composite Index (KLCI) return series over the period of 2 January 1990-31 December 2002. Their study utilizes the Hinich and Patterson (1995) window testing procedure similar to the Box-Pierce Q-statistic to detect linear serial dependencies, and a bivariate portmanteau test to detect non-linear serial dependencies. Their results indicate the presence of both linear and non-linear dependencies in the series. However, the correlations are found at random intervals for a short period of time, implying that they are episode and transient in nature. The authors conclude that the weak-form EMH and behavioural finance co-exists in the stock market of Malaysia.

Munir and Mansur (2009) investigate the behaviour of KLCI for the period of January 1980-August 2008, by using a two-regime threshold autoregressive (TAR) model with an autoregressive unit root to test for nonlinearity and nonstationarity simultaneously. Their result shows that, the index series is nonlinear and can be characterized by a unit root process. There is strong evidence provided by their study to support the weak-form EMH for the Malaysian stock market.

Lim (2008) examines the relative efficiency of eight economic sectors from the Malaysian stock market, including construction, consumer product, finance, industrial, industrial product, properties, tin and mining, and also, trade and service for the period of 1 January 1994 to 31 October 2006. The impact of Asian financial crisis on the sectoral efficiency is also examined. The study applies the rolling bivariate test statistic on the data of log index daily returns to detect nonlinear serial dependence in the series. The tin and mining sector is found to be the most efficient sector. Conversely, the properties sector is identified to have the most persistent deviations from random walk over time. All sectors except tin and mining experience the highest inefficiency during the crisis period, referring to the period of 2 July 1997-31 August 1998.

Bank stock efficiency has attracted little attention from researchers either in Malaysia or other countries. By comparison, researchers have

paid more attention on the semi-strong form efficiency than the weak-form efficiency for bank stocks. This review captures a few past studies of semi-strong form EMH on bank stocks exclusively. Ioannidis *et al.* (2008) study bank stock returns and publicly available information by estimating the cost and profit efficiencies for 19 Asian and Latin American public listed banks, including 260 commercial banks, and bank holding companies, over the period of 2000-2006. In the finding, there is a robust relationship between the changes in profit efficiency with stock returns. It suggests that profit efficiency can better explain the returns of bank stocks than traditional profits measure such as the return on equity (ROE). More recently, Janoudi (2014) examines the relationship between cost and profit efficiencies of banks with the bank stock performance in the EU markets using a sample of 141 commercial banks, for the period of 2004-2010. The study employs the stochastic frontier analysis (SFA) to estimate the cost and profit efficiencies of the EU banking sectors, and investigates if the changes in cost and profit efficiencies are reflected in the annual stock returns of the banks. In the finding, both the changes in cost and profit efficiencies are found to be significant. Stocks with cost and profit efficiencies tend to outperform their inefficient counterparts.

In the context of Malaysia, there are a few previous studies that employ the data envelopment analysis (DEA) to study the relationship between technical efficiency and stock returns of the domestic banks. However, the evidence from applying such methodology will be related to a semi-strong form EMH (see Habibullah *et al.* 2005). For instance, Habibullah *et al.* (2005) utilizes the DEA method to compute the overall technical efficiency and to decompose it into pure technical efficiency, scale efficiency, and congestion efficiency. Then, the relationship between technical efficiency and the returns of selected bank stocks is analyzed. It is found that the percentage changes in stock prices reflect the percentage changes in the overall technical efficiency. The results suggest that the stock returns of Malaysian bank stocks are inefficient in the semi-strong form. The study by Sufian (2006) has investigated the efficiency of the Malaysian Islamic banking sector for the period of 2001-2004 by employing the DEA method. In the study, a sample of 15 domestic and foreign Islamic banks is used. Meantime, technical efficiency is decomposed into pure technical and scale efficiencies. The results show that scale efficiency dominates pure technical efficiency. Sufian and Majid (2007) investigate the X-efficiency and P-efficiencies

of the Malaysian banks listed on the Kuala Lumpur Stock Exchange during the period of 2002-2003. From using the DEA method, the results indicate that the X-efficiency of the selected banks is on average significantly higher than the P-efficiency of these banks. In addition, the larger banks are associated with relatively higher X-efficiency, but the smaller banks with higher P-efficiency. Furthermore, the share prices of these banks are found to react more to the improvement in P-efficiency compared to X-efficiency.

Turning to the studies of weak-form EMH on bank stocks in particular, the empirical literature is obviously limited. There are only a handful of related past studies. Stengos and Panas (1992) examine both the weak-form and semi-strong form EMH for the four largest banks listed at the Athens Stock Exchange, namely Ktimatiki, Ergasias, Emporiki, and Ethniki, for the period of January 1985-October 1988. The data used are the daily closing prices of the bank stocks. The results from using the test developed by Brock, Dechert and Scheinkman (1987) do not show the evidence of linear or nonlinear dependence. Hence, the results can support the weak-form EMH. Furthermore, the results from cointegration and Granger causality tests refute the inefficiency in the semi-strong form. The overall finding of the study is in favour of the market efficiency for the selected bank stocks.

Bashir *et al.* (2011) have examined the weak-form EMH for 11 bank stocks from Karachi Stock Exchange over the period of June 1997-April 2009. The data applied in the study are the daily closing prices for the selected bank stocks. For estimation, the ADF and PP tests are utilized for stationarity check, and the co-integration and VAR tests are used to examine the weak-form EMH. The results of the study show the presence of predictable patterns in the stock prices, thus the results refute the EMH for the bank stocks. It is remarked that the market inefficiency may be caused by speculative bubbles.

In Malaysia, Lim *et al.* (2007) have addressed the question of whether stock prices follow a random walk process by using a sample of four commercial banks, namely, Hong Leong Bank, Malayan Banking, Public Bank, and Southern Bank, over the period of 1 January 1990 to 30 June 2004. He splits the data by utilizing the windowed-test procedure of Hinich and Patterson (1995), in which the data are separately into a set of non-overlapping windows of 30 trading days in

length. The results show both  $C$  and  $H$  statistics are significant. In other words, there are linear and nonlinear dependencies in the stock returns. The results suggest that the stock returns are predictable to some extent. However, the predictable patterns are found to be non-persistence. The study provides finding that justify for the role of technical analysis. Nevertheless, the authors point out that it will be a challenge for analysts to develop specific trading rules which can exploit the predictable patterns discovered mainly because they are only short-term phenomenon. The importance of using the timing strategies is highlighted by the authors. Clearly, bank stock efficiency has not been given adequate research attention. Indeed, the study on this topic needs to be extended.

## **2. Data and Methodology**

### **2.1 Dataset**

We obtain the dataset of daily closing prices for ten Malaysian bank stocks from Datastream, including AFFIN (Affin Holdings Berhad), AFG (Alliance Financial Group Bhd), AMBANK (AMMB Holdings Berhad), BIMB (BIMB Holdings Bhd), CIMB (CIMB Group Holdings Berhad), HLBANK (Hong Leong Bank Berhad), HLFG (Hong Leong Financial Group Bhd), MAYBANK (Malayan Bank Berhad), PBBANK (Public Bank Berhad), and RHBCAP (RHB Capital Bhd). This study uses a balanced dataset covering the period from 17 October 1994 to 23 May 2014. We obtain a total of 5115 observations. The data of log prices are used for estimation. The series are displayed in Figure 1 in Appendix A and appear to be subject to several structural changes. We observe wild behaviours for all bank series around 1997, a time of Asian financial crisis. It seems that all the data sets contain many non-normal observations for which robust tests may be more appropriate than the usual tests.

### **2.2 Methodology**

In this section, we briefly describe the test for the null hypothesis of stationarity that allows for multiple structural breaks in panel data developed by Carrion-i-Silvestre *et al.* (2005). This test generalizes the panel stationarity test of Hadri (2000) for the case of multiple changes in level and slope. It is written as follows:

$$U_{i,t} = \alpha_i + \sum_{k=1}^{m_i} \theta_{i,k} DU_{i,k,t} + \beta_i t + \sum_{k=1}^{m_i} \gamma_{i,k} DT_{i,k,t}^* + \varepsilon_{i,t} \quad (1)$$

Where  $U_{i,t}$  represents banking stock prices of each individual banks  $i = 1, \dots, N$  and  $t = 1, \dots, T$  time periods; and  $\varepsilon_{i,t}$  is the error term. In addition, The dummy variables  $DU_{i,k,t}$  and  $DT_{i,k,t}^*$  are defined as  $DU_{i,k,t} = 1$  for  $t > T_{b,k}^i$  and 0 otherwise; and  $DT_{i,k,t}^* = t - T_{b,k}^i$  for  $t > T_{b,k}^i$  and 0 otherwise; where  $T_{b,k}^i$  denotes the  $k$ th date of the break for the  $i$ th individual,  $k = 1, \dots, m_i$ ,  $m_i \geq 1$ .

The specification in (1) is general enough to allow for unit-specific intercepts and linear trends in addition to unit-specific mean and slope shifts. To test the null hypothesis of a stationary panel, Carrion-i-Silvestre *et al.* (2005) follows the Hadri (2000) procedure, which is constructed using a simple average of the univariate stationarity test in Kwiatkoeski *et al.* (1992) (KPSS hereafter). The test statistics is given by:

$$LM(\lambda) = N^{-1} \sum_{i=1}^N \left( \hat{\omega}_i^{-2} T^{-2} \sum_{t=1}^T \hat{S}_{i,t}^2 \right) \quad (2)$$

Where  $LM(\hat{\lambda}_i) = \hat{\omega}_i^{-2} T^{-2} \sum_{t=1}^T \hat{S}_{i,t}^2$  is the univariate KPSS test for individual  $i$ , and  $\hat{S}_{i,t} = \sum_{j=1}^t \hat{\varepsilon}_{i,j}$  denotes the partial sum process that is obtained using the estimated OLS residuals from eq. (1), with  $\hat{\omega}_i^{-2}$  being a consistent estimate of the long-run variance of  $\varepsilon_{i,t}$ . In this paper, we follow the procedure as in Kurozumi (2002) and estimate the long-run variance non-parametrically with the bandwidth of the Bartlett kernel fixed according to<sup>4</sup>.

$$\hat{I} = \min \left\{ 1.144 \left( \frac{4\hat{a}^2 T}{(1+\hat{a})^2 (1-\hat{a})^2} \right)^{1/3}, 1.144 \left( \frac{4k^2 T}{(1+k)^2 (1-k)^2} \right)^{1/3} \right\}, \quad (3)$$

<sup>4</sup> Lee (1996) and Kurozumi (2002) suggest that the lag selection procedure in Andrews and Monahan (1992) should not be used to calculate the long-run variance for the KPSS test as it may leads to inconsistency in the test.



Where  $\hat{a}$  is the autoregressive parameter estimated with the method proposed by Andrews (1991) and  $k = 0.7$  is the preferred value according to Kurozumi's simulations that maintains a compromise between size and power performance.

Since the test is dependent on the vector  $\lambda_i = (\lambda_{i,1}, \dots, \lambda_{i,m_i})' = (T_{b,1}^i/T, \dots, T_{b,m_i}^i/T)'$  for each  $i$ , which indicates the relative positions of the dates of the breaks on the entire time period ( $T$ ), we estimate the vector  $\lambda_i$  for each unit using the procedure of Bai and Perron (1998) which is based upon the global minimization of the sum of squared residuals (SSR). The procedure is chosen as the location estimation of the breaks for the argument that minimizes the sequence of the unit-specific  $SSR(T_{b,1}^i/T, \dots, T_{m_i,1}^i)$  obtained from Eq. (1) such that:

$$(\hat{T}_{b,1}^i, \dots, \hat{T}_{b,m_i}^i) = \arg \min SSR(T_{b,1}^i, \dots, T_{b,m_i}^i) \quad (4)$$

Having obtained the dates for all possible  $m_i \leq m^{\max}$  for each  $i$ , where  $m^{\max}$  is the maximum number of breaks, we select the appropriate number of structural breaks using the modified Schwarz information criterion (LWZ) of Liu *et al.* (1997), which is designed for the case of trending variables. Once the vector  $\hat{\lambda}_i$  is determined, we compute the normalized test statistic as follows:

$$Z(\hat{\lambda}) = \frac{\sqrt{N}(LM(\hat{\lambda}) - \bar{\xi})}{\bar{\zeta}} \xrightarrow{d} N(0,1), \quad (5)$$

Where  $\bar{\xi}$  and  $\bar{\zeta}^2$  are computed as the respective averages of the individual means and variances of  $LM_i(\hat{\lambda}_i)$ . The computation of the  $Z(\hat{\lambda})$  statistic requires the individual series to be cross-sectionally independent along with asymptotic normality. Since these assumptions may be overly simplistic, we compute the bootstrap distribution of the panel stationary test with multiple breaks following Maddala and Wu (1999) in order to allow for any kind of cross-sectional dependence, thereby correcting for finite-sample bias.

### 3. Empirical Results

#### 3.1 Univariate Unit Root Tests

We begin the testing for unit root or stationarity by applying traditional univariate unit root tests. As depicted in Table 1 below, the unit root tests of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) consistently indicate almost all series are integrated at order one, that is, the series are stationary in the first difference, which is a AR(1) model. However, in the levels, for the PBBANK the null hypothesis that the series has a unit root can be rejected at 5% level of significance.

**Table 1:** Results from the traditional univariate unit root tests

|         | ADF     |          | PP       |          |
|---------|---------|----------|----------|----------|
|         | levels  | 1st diff | levels   | 1st diff |
| AFFIN   | 1.989   | 47.949*  | 2.006    | 70.078*  |
| AFG     | 2.543   | 71.566*  | -2.592   | 71.566*  |
| AMBank  | -2.309  | 65.569*  | -2.328   | 65.671*  |
| BIMB    | 1.615   | 75.824*  | 1.540    | 76.095*  |
| CIMB    | 2.633   | 67.733*  | 2.694    | 67.811*  |
| HLBank  | 2.632   | 47.016*  | 2.663    | 69.807*  |
| HLFG    | 2.517   | 69.459*  | 2.546    | 69.469*  |
| MAYBank | 2.470   | 71.298*  | 2.437    | 71.308*  |
| PBBANK  | 3.444** | 34.994*  | 3.391*** | 69.526*  |
| RHBCAP  | 2.107   | 66.850*  | 2.116    | 66.843*  |

Note: \*, \*\* and \*\*\* denote rejection of null at the 1%, 5% and 10% level, respectively.

#### 3.2 Traditional Panel Unit Root Tests

Conventional unit roots tests for individual series (Augmented Dickey Fuller (ADF) and Phillips and Perron (PP), among others) are known to have low power against the alternative of stationarity of the series, particularly for small samples. In order to overcome this issue, we employ different panel tests (first generation), which differ in their treatment of the null hypothesis. For instance, the Breitung (2000) t-test and Levin *et al.* (LLC 2002) test specifies the null as a unit root and assumes common unit root processes. The Im *et al.* (IPS 2003) w-test and the ADF and PP Fisher chi-squared tests proposed by Maddala and Wu (1999) specify the null as a unit root but assume individual unit root

processes. Finally, the Hadri (2000) z-test treats the null as no unit root and assumes common unit root processes.

The results from these panel unit root tests are presented in table 2. The results from LLC t-stat, Breitung t-stat and IPS w-stat indicate that we can reject the null hypothesis of unit root at least at the 5% level of significance. As opposed to foregoing test results, Hadri Z-stat provides result that can reject the null hypothesis of stationarity at the 1% level of significance, indicating the series are nonstationary or has a unit root. This result is consistent with the other two tests, ADF-Fisher Chi-square, and PP-Fisher Chi-square, which indicate the non-rejection of the null hypothesis of unit root for the series (see Table 2 below). To sum up, the results of three out of six tests indicating all the commercial bank series follow a random walk process, suggesting the bank stocks are weak-form efficient. Whereas, the results of other three panel unit root tests do not provide any evidence for the EMH. These contradicting results from the traditional panel unit root tests are due to the negligence of accounting for cross-sectional dependence and structural breaks<sup>5</sup>.

**Table 2:** Results from traditional panel unit root tests

|                         | <b>T-statistics</b> | <b>p-value</b> |
|-------------------------|---------------------|----------------|
| LLC t-stat              | -2.27193            | 0.0115         |
| Breitung t-stat         | -2.43686            | 0.0074         |
| IPS w-stat              | -1.8646             | 0.0311         |
| ADF - Fisher Chi-square | 27.7609             | 0.1152         |
| PP - Fisher Chi-square  | 22.8612             | 0.2957         |
| Hadri z-stat            | 71.4099             | 0.0000         |

Note: Above T-statistics and p-value are obtained using the automatic lag length selection based on AIC: 1 to 30.

<sup>5</sup> One reason for this result may be that during the last few decades we have experienced an ever-increasing economic and financial integration of banking sector and financial entities, which implies strong interdependencies between cross-sectional units. When applying the traditional unit root tests, who construct with the assumption of independence, ignore the issue of cross-section dependence and providing contradicting results as in our case. Thus, when dealing with the financial data which exhibit structural breaks and cross-sectional dependence, it may be possible that these tests will produce inconsistent results due to the negligence of these empirical aspects (see Carrion *et al*, 2005 on this issue). This is the issue we address in this study.

### 3.3 Test for Cross-Sectional Dependence

So far, the presentation of the panel statistics has assumed that individuals are cross-section independent. However, this assumption might be restrictive in practice since the analysis of macroeconomic time series for different banks are affected by similar major events that might introduce dependence among individuals in the panel data set. In many aspects the selected banks are related to each other, and it is very likely that these banks are simultaneously affected by common observed global shocks, such as financial crises (such as 1997-1999, 2008-2010), due to specific domestic or sectoral shocks or changes in oil prices. The presence of common shocks is likely to generate dependence among the units in the panel, although their impact may not be the same across different cross-section units. Therefore, we need to select panel unit root test that are robust to cross-section dependence in order to avoid size distortions of the tests.

Before deciding whether to allow for general forms of cross-sectional dependence when testing for a unit root in the series, we need to test for the prevalence of cross-correlation in innovations to the series. This is important because there are two main caveats associated with the presence or absence of cross-sectional dependence when testing for a unit root in a panel setting. First, traditional panel unit root tests which are derived under the assumption of cross-sectional independence are subject to large size distortions when there is a substantial degree of cross-correlation (see O'Connell 1998; Maddala & Wu 1999). Second, panel unit root tests allowing for cross-correlation suffer from substantial power losses when cross-sectional dependence is not present in the data.

In order to test the cross-section dependence among the individuals we use the CD statistic of Pesaran (2004). Pesaran (2004) proposed a simple test of error cross-sectional dependence which is suitable for both stationary and nonstationary panels under very general conditions. The cross dependence test is based on the average of pair-wise correlation coefficients of OLS residuals obtained from standard augmented Dickey–Fuller (1979, ADF) regressions for each individual. Let  $\hat{\rho}_{ij}$  be the sample estimate of pair-wise correlation coefficients of OLS residuals such that:

$$\hat{p}_{ij} = \hat{p}_{ji} = \frac{\sum_{t=1}^T e_{it} e_{jt}}{\left( \sum_{t=1}^T e_{it}^2 \right)^{1/2} \left( \sum_{t=1}^T e_{jt}^2 \right)^{1/2}}$$

where  $e_{it}$  represents the OLS estimated residuals for individual  $i$ . Based on pair-wise correlation coefficients, Pesaran's test does not depend on any particular spatial weight matrix as is the case for the Breusch and Pagan (1980)'s LM test when the cross-sectional dimension ( $N$ ) is large. The CD statistic in Pesaran (2004) is given by:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left( \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{p}_{ij} \right) \rightarrow N(0,1)$$

The Pesaran's  $CD$  statistic tests the null of cross-sectional independence and is distributed as a two-tailed standard normal distribution.

### 3.4 Cross-sectional Dependence Test Results

As clearly shown in Table 3, the CD statistic is highly significant for the commercial bank series, which implies that the null hypothesis that innovations to the variable are cross-sectionally independent is strongly rejected at the 1% significance level. Although it is not the case here, a possible drawback of the CD test is that adding up positive and negative correlations may result in failing to reject the null hypothesis even if there is plenty of cross-sectional dependence in the errors. In addition, the average absolute correlation is 0.871, which is a very high value. Hence, there is enough evidence suggesting the presence of cross-sectional dependence in the selected bank series. This result accords with our expectation regarding the high degree of cross-sectional dependencies across Malaysian commercial bank caused by common shocks.

**Table 3:** Cross-sectional dependence test results

|                                      | Statistics |
|--------------------------------------|------------|
| $H_0$ : cross-sectional independence |            |
| CD test                              | 23.610*    |
| $p$ -value                           | 0.000      |
| Average ( $P_{i,j}$ )                | 0.871      |

Notes: The CD statistic tests for the null of cross-sectional independence and is distributed as a two-tailed standard normal distribution.\* implies rejection of the null hypothesis at 1%.

### 3.5 Panel Stationarity Tests and Individual Tests with Structural Breaks

Since the data appear to be cross-sectionally correlated, we proceed by testing for a unit root using the methods that allow for cross-sectional dependence and incorporating structural break, i.e. second generation panel unit tests. There are different procedures in the literature to deal with cross-section dependence and structural break. In this paper we proceed with the application of panel stationarity tests proposed by Carrión-i-Silvestre *et al.* (2005) which allow for the presence of multiple structural breaks and exploit the cross-section variations of the series studied.

Table 4 reports the Carrión-i-Silvestre *et al.* (2005) panel stationarity unit root test that allows for endogenously determined multiple structural breaks and is flexible enough to control for CSD by accommodating the appropriate critical values by the bootstrapping procedure. In Panel A of Table 4, the last four columns show the computed 10%, 5%, 2.5% and 1% finite KPSS critical values, by means of Monte Carlo simulations of 20,000 draws. These critical values are used to control for the finite sample bias that might be present in small samples used in the paper. Comparing the observed KPSS statistics with the finite sample KPSS 1% critical values, we reject the null hypothesis of stationarity for all the series. Therefore, the series of these ten bank stocks are non-stationary, suggesting the market is efficient.

Comparing the observed panel KPSS test statistics, using the assumptions of homogeneous and heterogeneous variance, with the bootstrapped empirically distributed critical values at the 1%, 5% and 10% levels we reject the joint null hypothesis of stationarity. Specifically, for both the homogeneous and heterogeneous variance assumptions, we find the actual panel KPSS test statistics are greater

than the bootstrapped critical values at the 1%, 5%, and 10% levels of significance. Thus, we can conclude that, after allowing for multiple structural breaks and controlled for CSD, the Malaysian bank stock series are nonstationary. Overall, the panel unit root test results are consistent with those of the individual country KPSS test results reported in Panel A of Table 4. From this exercise, we can conclude that the series contain unit root, suggesting the Malaysian bank stocks are efficient in the weak-form. These results are not consistent with Lim *et al.* (2007) and Bashir *et al.* (2011) who have found that bank stocks are not weak-form efficient, but are in line with Stengos and Panas (1992) who provide evidence showing bank stocks are weak-form efficient.

**Table 4:** Panel data stationarity tests and individual tests with structural breaks

| Panel A:Country-by-country tests                                                 |       |                 |                                   |        |       |
|----------------------------------------------------------------------------------|-------|-----------------|-----------------------------------|--------|-------|
|                                                                                  |       |                 | Finite sample critical values (%) |        |       |
|                                                                                  | KPSS  | m               | 10%                               | 5%     | 1%    |
| AFFIN                                                                            | 0.034 | 5               | 0.015                             | 0.017  | 0.021 |
| AFG                                                                              | 0.035 | 4               | 0.021                             | 0.023  | 0.029 |
| AMBANK                                                                           | 0.035 | 5               | 0.016                             | 0.017  | 0.021 |
| BIMB                                                                             | 0.027 | 5               | 0.015                             | 0.017  | 0.021 |
| CIMB                                                                             | 0.041 | 5               | 0.016                             | 0.018  | 0.022 |
| HLBANK                                                                           | 0.036 | 5               | 0.015                             | 0.017  | 0.021 |
| HLFG                                                                             | 0.040 | 5               | 0.016                             | 0.017  | 0.021 |
| MAYBANK                                                                          | 0.036 | 5               | 0.016                             | 0.017  | 0.022 |
| PBBANK                                                                           | 0.033 | 5               | 0.015                             | 0.017  | 0.021 |
| RHBCAP                                                                           | 0.038 | 5               | 0.015                             | 0.017  | 0.02  |
| Panel B:Panel KPSS test with multiple breaks assuming cross-section independence |       |                 |                                   |        |       |
|                                                                                  |       | Test statistics | p-value                           |        |       |
| LM( $\lambda$ )(Homo)                                                            |       | 23.316          | 0.000                             |        |       |
| LM( $\lambda$ )(Hetero)                                                          |       | 22.739          | 0.000                             |        |       |
| Panel C:Bootstrap distribution (Allowing for cross-section dependence)           |       |                 |                                   |        |       |
|                                                                                  |       | 90%             | 95%                               | 99%    |       |
| LM( $\lambda$ )(Homo)                                                            |       | 7.095           | 8.198                             | 10.425 |       |
| LM( $\lambda$ )(Hetero)                                                          |       | 4.376           | 5.336                             | 7.25   |       |

Note: The finite sample critical values were computed by means of Monte Carlo simulation using 20,000 replications following Maddala and Wu (1999). All bootstrap critical values allow for cross-section dependence.

Table 5 reports the significant breakpoints identified from the bank stock prices series. The first common breaks for all series may correspond to the Asian financial crisis, 1997-1998. Malaysia has experienced the tremendous impact of the crisis through the rapid reversal of capital inflows aftermath to the crisis. This has led to a decline in the country's nominal and real exchange rates. In addition, interest rates are reduced accompanied by the tightening of credit conditions in the domestic market (see Radelet and Sachs 1998). The foregoing reflects a direct adverse effect on the domestic banks' credit activities as well as their profits. This can plausibly explain the breakpoints around the Asian financial crisis period. Meantime, there are a few other landmarks events which coincide with the breakpoints in the series. The breaks around the year 2000 possibly mark the event of Dotcom crash which has began in 2000 and lasts until 2002. Then, the breaks around the period of 2004-2006 are probably the consequence of the fluctuations in world crude oil prices. The recent breaks around the period of 2008-2011 may associate with several major global economic and financial turbulences, including the United States subprime mortgage crisis of 2008, the Great Recession of December 2007-June 2009, the European sovereign debt crisis of late 2009, and the 2011 global economic downturn. During the periods of these events, the level of risk aversion among stock market investors might have increased and thus causing significant changes in the stock market investment.

**Table 5:** Location of the breaks for each series

|         | $T_{b,1}$  | $T_{b,2}$  | $T_{b,3}$  | $T_{b,4}$ | $T_{b,5}$  |  |
|---------|------------|------------|------------|-----------|------------|--|
| AFFIN   | 17/10/1997 | 26/9/2000  | 12/2/2004  | 3/7/2008  | 15/6/2011  |  |
| AFG     | 17/10/1997 | 26/9/2000  | 8/10/2003  | 23/9/2008 | -          |  |
| AMBank  | 22/10/1997 | 29/9/2000  | 28/3/2005  | 2/7/2008  | 10/6/2011  |  |
| BIMB    | 14/11/1997 | 24/10/2000 | 1/4/2005   | 27/6/2008 | 7/6/2011   |  |
| CIMB    | 17/10/1997 | 26/9/2000  | 4/9/2003   | 17/6/2008 | 26/5/2011  |  |
| HLBank  | 17/11/1997 | 3/11/2000  | 7/4/2004   | 7/7/2008  | 15/6/2011  |  |
| HLFG    | 27/10/1997 | 12/12/2000 | 1/12/2003  | 8/11/2006 | 16/10/2009 |  |
| MAYBank | 22/10/1997 | 2/11/2000  | 13/10/2003 | 3/7/2008  | 13/6/2011  |  |
| PBBank  | 1/10/1997  | 8/9/2000   | 25/12/2003 | 17/1/2007 | 25/12/2009 |  |
| RHBCAP  | 23/9/1997  | 1/9/2000   | 12/8/2003  | 15/1/2007 | 19/7/2010  |  |



## Summary and Conclusion

In this study, we examine the weak-form EMH for ten commercial bank stocks from Malaysia over the period of 17 October 1994 to 23 May 2014. To the knowledge of the authors, there has been no study examining the empirical validity of efficient market hypothesis of banking series by addressing the issue of cross-country dependence as well as multiple structural breaks.

We first demonstrate the use of comparative tests for unit root stationarity. The results from traditional univariate unit root tests of ADF and PP indicate the null hypothesis that the series has a unit root can be rejected at the 5% level of significance for almost all series, except PBBANK. Then, we apply traditional panel unit root tests to check the robustness of the results from univariate unit root tests. However, panel unit root tests, including Levin, LLC t-stat, Breitung t-stat, IPS W-stat, ADF-Fisher Chi-square, PP-Fisher Chi-square, and Hadri Z-stat provide mixed results of the nonstationarity of commercial bank stock series.

To date, there is a consensus that the traditional unit root tests have low power to reject the unit root null hypothesis when the true data generating process is stationary about a broken linear trend (Perron, 1989). Thus, ignoring structural breaks if present in the data is likely to produce spurious result. To address this issue, we apply the panel stationarity tests proposed by Carrión-i-Silvestre *et al.* (2005) that allow for the presence of multiple structural breaks and exploit the cross-section variations in the series. The result from KPSS test indicates multiple breakpoints for all the banking series. More importantly, the result from panel stationarity tests suggesting that we can reject the null hypothesis that the series is stationary at 1% level of significance for all series. Comparing the observed panel KPSS test statistics, using the assumptions of homogeneous and heterogeneous variance, with the bootstrapped empirically distributed critical values at the 1%, 5% and 10% levels we reject the joint null hypothesis of stationarity. Specifically, for both the homogeneous and heterogeneous variance assumptions, we find the actual panel KPSS test statistics are greater than the bootstrapped critical values at the 1%, 5%, and 10% levels of significance. We can conclude that, after allowing for multiple structural breaks and controlled for CSD, the Malaysian bank stocks series are

nonstationary. Overall, the panel unit root test results are consistent with those of the individual country KPSS test results. These results confirm the nonstationarity of commercial bank stock series, implying the bank stocks are weak-form efficient.

The finding that the Malaysian banking sector is weak-form efficient has several salient implications. First, we expect that the commercial banks currently listed at the stock exchange in Malaysia will be able to raise long-term capital through their equity issues. The efficient bank stocks are relatively more attractive to investors as compared to their less efficient counterparts, because the prices of bank stocks provide accurate signals to guide the investment decision-making by investors. Thus, investors can buy and sell shares quickly and cheaply. Enhanced liquidity, therefore, smooth the investment in long-run for these commercial banks. Second, we foresee that the efficiency of these commercial banks are likely to contribute towards strengthening the banking sector's ability in complying with the International Regulatory Framework for Banks (Basel III) minimum capital requirements by 1 January 2019. The minimum equity tier 1 of 7 percent equals to minimum equity of 4.5 percent with capital conservation buffer of 2.5 percent. The banking group of Malaysia is expected to be able to comply with the minimum capital requirements in the low and baseline growth scenarios, but not in the high growth scenario (IMF 2014).<sup>6</sup> Malaysia is on the path of transformation into a high income country, hence it is crucial for the country to enhance the existing liquidity and capital standards of the banking sector. Third, as our finding indicates that the commercial bank stocks are weak-form efficient, suggesting investors will be better-off by simply buy-and-hold over the long-term investment horizon rather than by frequently trades over short-horizon or speculate. In particular, frequent buying and selling will incur higher transaction costs. Fourth, the finding in this study hints that technical analysis cannot be used to earn a consistent excess return from the market of these commercial bank stocks. Fifth, the weak-form efficiency of the commercial bank stocks signals that the effect of shocks to stock prices is permanent. If stock prices follow a random walk or unit root process,

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<sup>6</sup> Low growth scenario reflects yearly real gross domestic product (GDP) growth of 2 percent, inflation of 1 percent, and loan growth of 3.6 percent; Baseline growth scenario indicates yearly real GDP growth of 5 percent, inflation of 2.5 percent, and loan growth of 8.2 percent; High growth scenario is associated with yearly real GDP growth of 6.5 percent, inflation of 4 percent, and loan growth of 12.2 (IMF, 2014).

shocks to prices will have a permanent effect in which a new equilibrium can be attained, implying that past sequence in prices cannot be used to predict future prices (Narayan and Smyth 2004; Narayan and Narayan 2007; Munir *et al.* 2012)

Lastly, we suggest for future studies to investigate different aspects of return predictability for bank stocks exclusively, such as the momentum and seasonal effects, and so forth. Long-run anomalies can be a violation to the EMH (Fama 1998), therefore it is crucial to identify the presence of persistent stable predictable patterns in a stock price series.

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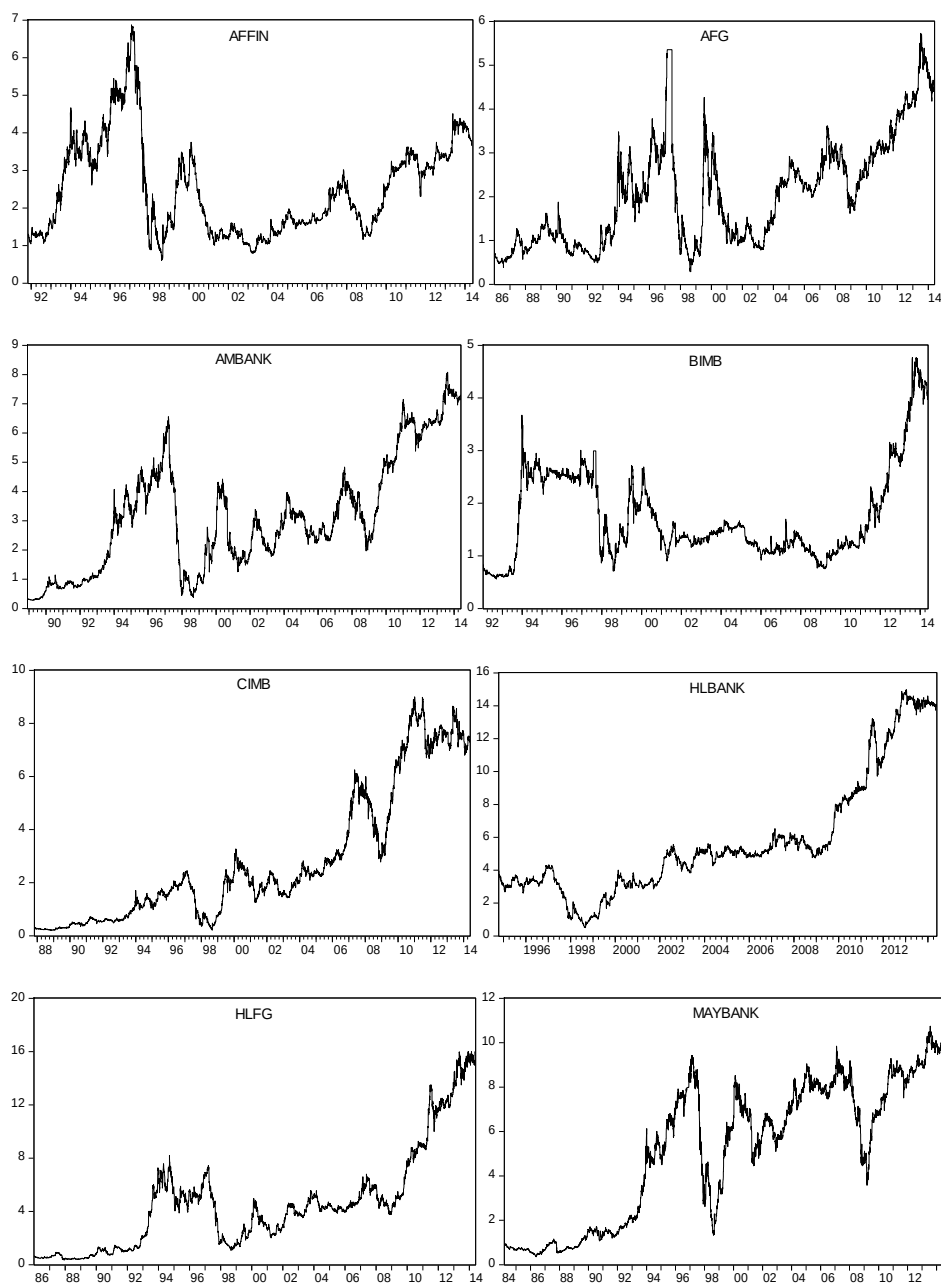
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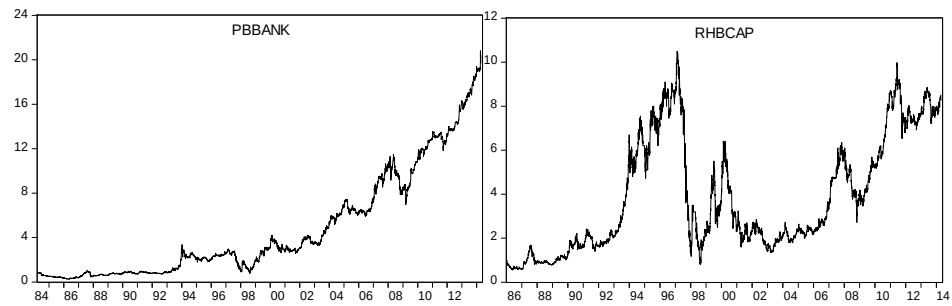
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### Appendix A

**Figure 1:** Selected Malaysian commercial banks stock prices







## **The Islamic Banking and Economic Growth Nexus: A Panel VAR Analysis for Organization of Islamic Cooperation (OIC) Countries**

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In this paper, we investigate the impact of Islamic banking variables on economic growth in a panel setting for 14 member countries of the Organization of Islamic Countries during 1999-2011 period. We examine the short-run effects as well as long-run effects by employing the Panel VAR method. We find a positive and significant relationship between Islamic finance and economic growth. This relationship is robust with regard to several macroeconomic control variables such as capital stock, unemployment, inflation, and government expenditure. We show that an increase in the share of Islamic deposits, assets, and loans in total banking instruments results in an increase in economic growth. The results also show that in the long run, economic growth responds positively to shocks in Islamic instruments, namely Islamic deposits, investments, and size. Shocks in Islamic banking contribute to more than 3% of the forecast error in economic growth in the next 10 year period.

### **1. Introduction**

The relationship between financial development and economic growth has attracted a great deal of attention targeted at improving the banking industry and other financial intermediaries. One of the most important factors of economic growth is the financial market. When financial markets develop, individuals tend to save more, leading to increased capital accumulation. The increase of capital accumulation in turn stimulates investments. As a result of increased investment, more capital is allocated to the process of production, thereby contributing positively to economic growth. There are many different views related to the financial market and economic growth nexus. Levine (1997) indicated

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that financial intermediaries play an important role. Financial intermediaries are a part of financial markets that not only provide risk diversification services but also help to allocate resources for economic growth.

The role of Islamic finance has increased in importance over time in the financial markets. Although the modern history of Islamic finance began nearly forty years ago, massive improvements achieved after the 1980s, especially with regard to Islamic finance, have led to rapid growth in recent decades. While Islamic assets were approximately USD 150 million in the 1990s (Grewal, 2011), the market size of these assets is estimated to reach USD 2 trillion at the end of 2014 (Cummings, The City UK, 2013). With regard to the development of Islamic finance, Islamic banking, that is, interest-free banking, has been rapidly increasing in importance. The rules of Islamic banking are based on principles of Sharia. Money is used as a medium of exchange. Furthermore, these banks are prohibited from certain transactions such as any business concerning alcohol, gambling, excessive speculation. Apart from these, profit and loss sharing principles are the crux of Islamic finance. According to profit and loss sharing (PLS), the relationship between lender, borrower, and intermediary depend on financial trust and partnership (Yudistira, 2004). There are three basic components of Islamic financial institutions, especially Islamic banking, that can compete against other financial constructions. Meanwhile, these components help to promote socially and ethically responsible business practices. Business practices are crafted under Sharia supervision, screening, and community based investment (Zaher and Hassan, 2001).

Although the Islamic banking and economic growth nexus has garnered some attention in academic literature, to date there are limited studies about this subject. Furqani and Mulyany (2009) shows there is a relationship between Islamic finance and economic growth. While they found no causal relationship between Islamic banking and economic growth in the short term, they did find a uni-directional relationship between Islamic banking and investments. When investments increased by Islamic banking, real sectors developed in Malaysia. However, in the long term the increase in Islamic banking finance encouraged an entrepreneurial response in the productive sectors and increased investments, while at the same time increased investment supported the development of Islamic banking. On the other hand, financial

development follows economic growth. Economic growth causes Islamic banking institutions to change and develop. When an economy grows, it creates a demand for financial intermediation.

We aim to determine that the economic growth and Islamic banking nexus is significant and to describe the effects of Islamic banking on economic growth in the long run by using Panel VAR analysis for members of the Organization of Islamic Cooperation (OIC). First, we used panel fixed effect regressions to analyze the relationship between economic growth and Islamic banking sector variables, employing other determinants of economic growth. Second, to understand the long-run relationship between both of them, we apply a panel data vector-autoregressive model, which is followed by impulse response function and forecast error variance decomposition. Depending on impulse response function, changes in the variables are exhibited by shocks to error terms in the equations of the structural VAR form. We also compute forecast error variance decompositions of growth to interpret what proxy measures are the most important in economic growth and how much they contribute to economic growth apart from Islamic finance.

The distinction of this study is that we aim primarily to examine not only Malaysia or other selected countries but to also investigate other countries which have large communities of Muslims. Whereas other studies have employed panel cointegration analysis, we searched for the Islamic banking and economic growth link by using the Panel VAR method. In this way we tried to determine the contribution of Islamic finance and other control variables.

This paper is organized as follows. Section II provides a literature review. We explain data and proxy measures of financial development, economic growth, and various control variables in Section III. Section IV describes the panel fixed effects and panel VAR model. We analyze the empirical results in Section V, and Section VI provides the concluding remarks.

## **2. Literature Review**

We looked at the finance and economic growth nexus in literature before we investigated the relationship between Islamic banking and economic growth. First, prior studies discussed how financial intermediaries

stimulate technological innovation and economic development. Financial development contributes to the mobilization of productive savings and improves risk management by evaluating projects (King and Levine, 1993a). Goldsmith (1969) states that the link between financial development and economic activity is positively correlated (Demirguc-Kunt and Levine, 2001). Efficient financial systems can promote economic growth while financial depressions cause a decline in investment through savings (Huang, 2010). When we examine contemporary theoretical and empirical studies about the relationship between economic growth and finance nexus, (Greenwood and Jovonavic (1990); Bencivenga and Smith (1991); Roubini and Sala-i-Martin (1992); King and Levine (1993a); Greenwood and Smith 1997) indicate that growth and financial structure are inevitably linked and that financial repression affects economic growth negatively. Therefore, financial markets and institutions become more efficient by evaluating and monitoring services. They influence the decision to either invest or to mitigate transaction cost frictions and the effects of information (Hassan, Sanchez & Yu, 2011). Such productivity improving mechanism contributes to economic growth positively.

Authors examine the direction of causality in the finance and economic growth nexus by evaluating empirical and theoretical models. Some authors find a causal direction from financial development to economic growth. Development of financial systems tend to affect economic growth [McKinnon (1973), King and Levin (1993a), Levine, Loayza & Beck (2000), Christopoulos and Tsionas (2004)]. Yet, other scholars find the causality runs from economic growth to financial development. As the economy grows, the demand for financial services increases which stimulates expansion in financial sector. Gurley and Shaw (1967), Goldsmith (1969) and Jung (1986) supported this opinion.

On the other hand, a few scholars show a bidirectional causality relationship between financial development and economic growth. Financial development and economic growth reinforce each other. Blackburn and Hung (1998) established a positive and two way causality relationships between financial development and economic growth. Luintel and Khan (1999) further outlined the bi-directional causality between financial development and economic growth. In credit-constrained economies, producers with access to financial intermediary loans obtain higher returns on their investments than other

producers. This creates incentives for others to undertake the technology adoption necessary to access investment loans. Therefore costs of financial intermediation decrease, while the rate of economic growth increases.

Patrick (1966) describes his hypothesis of the direction of causality between financial development and economic growth in relation to stages of economic development. In early stages of economic development, financial development stimulates growth and innovation. Resources are transferred from traditional to modern sectors of the economy and support the real sector. This situation indicates the supply-leading relationships. When the real sector develops in the stage of economic growth, demand for financial services increases. This increasing demand encourages an expansion in the financial sector as the real economy grows. Therefore, in this model, causality runs economic growth to financial development under the demand-following hypothesis (Banerjee and Ghosh, 2010).

Levine (2005) and King and Levine (1993a,b) state that there is a strong positive link between the functioning of the financial system and long run economic growth. Khan and Senhadji (2000, 2003) finds an effective financial market impact economic growth positively. Claessens and Laeven (2005) indicates that a higher competition between banks leads to faster growths in external financially dependent sectors. Demetriades and Hussein (1996) and Shan, Morris and Sun (2001) find bidirectional causality by using the time series technique in their samples. Calderon and Liu (2002) examines 109 developing and industrial countries from the years 1960-1994. They find that economic growth encouraged financial development, while financial development stimulates economic growth. Moreover, financial deepening contributes more to the causal relationship in developing countries than in industrial countries.

A question naturally arises as to whether the size of Islamic banking sector has anything to do in the finance-growth nexus. There are limited studies in this area. Furqani and Mulyany (2009) shows an empirical model the relationship between Islamic finance and economic growth. For Malaysia over the period (1997Q1 to 2005Q4), they find that in the long run Islamic banking is positively and significantly correlated with economic growth and capital accumulation in Malaysia. Furthermore, development of financial institutions contributes to real economic sectors and long run economic welfare.



Abduh and Chowdhury (2012) examines the causal relationship between Islamic banking and economic growth in Bangladesh by using quarterly data (2004Q1 to 2011Q2). Abduh and Omar (2012) shows the Islamic banking and economic growth nexus for Indonesia through quarterly time series data (2003Q1 to 2010Q2). Both find a bi-directional relationship. Yazdan and Sadr (2012, 2013) also find a bi-directional relationship between Islamic banking and economic growth both in short-run and long-run. On the other find, Tabash and Dhankar (2014) finds the bi-directional between Islamic banks' financing and economic growth only for Bahrain and Qatar. They also find the development of the financial system lead to economic growth, but no causality in the opposite direction in UAE. Tajgardooun et al. (2013) also finds that Islamic banking and Islamic activities impact economic growth positively.

### **3. Data and Proxy Measures**

#### ***a. Structuring Panel Dataset***

Our sample period is 1999-2011 and it covers members of the Organization of Islamic Cooperation. While we started with seventeen Islamic countries, our study depends on fourteen countries due to data limitation. These countries are Bahrain, Egypt, Indonesia, Iran, Jordan, Kuwait, Malaysia, Mauritania, Qatar, Saudi Arabia, Sudan, Tunisia, Turkey and Yemen. This study employs not only financial development but also the real sector and linked economic growth. Furthermore we exploited this dataset effectively to estimate panel fixed effects regressions and to analyze Panel VAR method. Although various measures have been used in the literature regarding the level of financial development, we applied proxy measures either for financial development or real sector and economic growth from the Penn World Table 8.0 database, the World Bank's World Development Indicators 2009 (WDI), and Bankscope for 1999-2011. In our analysis we used real GDP growth rates for as a proxy for economic growth. On the other hand we used other determinants of financial development to examine effects of Islamic banking (Islamic size, Islamic Investment, Islamic deposit, Capital). At the same time our analysis depends on variables of the real sector (Unemployment, Government, Export Value). Moreover to understand human development, proxy measures (Human capital, Agriculture and Cellphone) are used in our study. Finally we included the inflation rate to control for price distortions.

## ***b. Data Descriptions for finance and economic growth***

### *Islamic Size, Investment, and Deposit*

We collected data about Islamic instruments from Bankscope. Whereas our data starts from 1998, we decided to use data beginning from 1999 because of missing 1998 data. Therefore our sample term includes 1999-2011. The main goal of this study is to determine whether economic growth is affected by Islamic instruments (Islamic size, investment, and deposit).

### *Capital stock*

Another important variable is capital stock to examine the impact of economic growth. De Long and Summers (1991) researched the relationship between equipment investment and GDP per worker growth for a sample of 61 countries from 1960 to 1985. They indicated that higher equipment investment increases economic growth. Also Mankiw, Romer, Weil (1992), Levine and Renelt (1992), Kormendi and Meguire (1985) showed that gross domestic investment has a significant positive effect on economic growth. According to Blomström, Lipsey and Zejan (1996) economic growth induces capital formation, not vice versa. Furthermore, Uneze (2013) found that higher economic growth causes higher capital formation, and increase of capital formation results in higher economic growth.

### *Inflation and Unemployment*

Inflation and unemployment are other control variables in our study. Mallik and Chowdhury (2001) estimated the inflation and economic growth nexus for Pakistan, Sri Lanka, India, and Bangladesh. They found a positive relationship between inflation and economic growth. Whereas some studies indicated that inflation affects economic growth negatively, Hussain and Malik (2011) found for Pakistan that there is a positive relationship between inflation and economic growth. Tobin effect shows high inflation leads people to invest more in physical capital, depend on increase of capital accumulation, it promotes economic growth [Jayathileke and Rathnayake (2013)]. Okun's law suggests that the three percent growth in real GDP is related to one percent decrease in the rate of unemployment [Akram et. al (2014)]. Andrei et. al (2009) found that real GDP and unemployment are

negatively correlated. Madito and Khumalo (2014) researched the economic growth and unemployment nexus in South Africa. They found that there is a negative strong relationship between economic growth and unemployment.

#### *Population Growth*

Population growth affects economic growth positively because of production, saving, and consumption. The larger populations are associated with higher population rates and faster technology improvement. It depends on population growth and causes an increase of labour productivity, per capita income, and improvement in living standards. Population growth could be beneficial or detrimental to economic growth and economic growth could have an impact on population growth. There is a one way granger causality running from population growth to economic growth for Finland, France, Portugal and Sweden. There is also bidirectional causality between population growth and economic growth for Japan [(Chang et al. 2014); Tsen and Furuoka (2005)]

#### *Human Capital*

Economic theory indicates that human capital is an important factor of economic growth. It affects physical investment positively. Barro (1992) and Awel (2013) found that human capital has a significant positive impact on economic growth in Sweden. Furthermore, there is a bidirectional causality running from human capital to output per worker. Chudárková and Verner (2012) finds a positive long-run relationship between economic growth and human capital for Austria.

#### *Offshore banking*

Offshore banking affects financial development and economic growth. Gordon (2011) found that for a sample of 15 Caribbean countries, the offshore banking sector has a positive effect on economic growth in host countries. The economic growth attributable to the offshore banking sector depends on the share of income used for domestic investment.

#### *Export Value*

The literature finds that there is a positive relationship between exports

and economic growth. When capacity utilization increases, productivity and greater product variety are gained, and the export of goods and services creates the opportunity to compete in the international markets (Stait, 2005). On the other hand, it facilitates technology transfer and improvement of managerial skills. The relationship between exports and economic growth is a dilemma for developing countries because of their economic politics. If they concentrate on export-led growth and access to technology via globalization, they will gain revenues dependent on new products (Mishra, 2011).

### *Agriculture*

Agricultural growth has played an important role in the process of economic development. It provides raw materials for non-agricultural production or demand inputs from the modern sector. When productivity in agriculture increases, the income of the rural population increases and the agricultural sector creates demand for domestically produced industrial output. It increases employment opportunities in the rural non-farm sector and also generates rural income indirectly. Furthermore, agricultural products can be exported to earn foreign exchange. Thus capital products can be purchased (Dethier and Effenberger, 2012). On the other hand low agricultural productivity can dramatically delay industrialization. If agricultural productivity improves, then industrialization can jumpstart economic growth (Gollin, Parente and Rogerson, 2002).

### *Government Expenditure*

Some studies indicate that the relationship between government expenditure and economic growth is negative. Barro (1990) analyzed the ratio of real government consumption to real GDP for 98 countries from 1960 to 1985 and found a negative and significant relationship. Alexiou (2009) finds a positive relationship between government expenditure and economic growth. Devarajan and Vinay (1996) showed that some government expenditures (health, communication, and transport) are positive and significant, but the relationship between the capital component of public expenditure and per capita income is negative. Gregoriou and Ghosh (2009) found that substantial government expenditure affects economic growth strongly, but Alexiou (2009) showed that government spending on capital formation, development

assistance, private investment, and trade-openness all have positive and significant effects on economic growth.

#### *Cell Phone Usage*

Mobile phones have a positive and significant impact on economic growth. Information technologies like cell phones can increase efficiencies in a country. It enables the exchange of information between a country's inhabitants and reduces the cost of acquiring information. In addition to decreasing search costs and increasing information availability, cell phone usage makes markets function more effectively. When the cell phone industry grows, it enables more jobs and creates more demand for products and services. This situation contributes to economic growth (Lum, 2011).

#### *Interest rates*

The relationship between interest rate and economic growth is ambiguous. For Nigeria during 1970-2010, the relationship was positive while others find the net effect of interest rates on investment is negative [(Udoka and Roland, 2012); Warman and Thirwall (1994)] High real interest rates on economic growth must be achieved by increasing the productivity of investment.

### **4. Methodology**

#### **a. Panel Fixed Effect Estimations**

We employ panel fixed effect regressions to analyze the relationship between the Islamic banking sector and economic growth, controlling for various determinants of growth. Following Hassan et. al. (2011), we define growth of real GDP as:

$$Growth_{i,t} = \log GDP_{i,t} - \log GDP_{i,t-1}, \quad i=\{1,2,...,N\}$$

where GDP is the real GDP and N is the number of countries. The first-order approximation of the neo-classical growth model implies that

$$Growth_{i,t} = -\lambda(Q_{i,t} - Q_{i,t}^*)$$

where  $\lambda$  is a positive convergent parameter. Let be the initial level of log (GDP) and the (long-run) steady state GDP. Therefore, a typical growth relationship can be written:

$$Growth_{i,t} = -\lambda Q_{i,t} + \gamma' X_{it} + \varepsilon_{it}$$

In our model,

$$Growth_{i,t} = \beta_0 Q_{i,1999} + \beta_1 ISLMC_{i,t} + \gamma' X_{it} + \varepsilon_{it}$$

Where  $Q_{i,1999}$  is the log of real GDP and represents the initial real GDP proxy, which resets every 3 years.  $=\{Inf, Unemp, CapStock, PopGrowth, IntRate, OffshoreBanking, HumanCap, AgrLand, GovExp, ExportValue, CellPhone\}$  is a vector of variables controlling for long-run GDP across countries. We perform three separate regressions to study the impact of Islamic finance on economic growth and present a different Islamic Banking variable in each panel of our tables.

The intercepts are estimated separately for each country  $i$ . Estimating intercepts separately is equivalent to demeaning the country-level data and ensures that each country's error term is orthogonal to the explanatory variables for that country. Thus, in a fixed-effects panel data regression setting, the results reflect the time-series relation between the dependent variable and the independent variables. We also use clustered standard errors by country.

## b. Panel VAR Approach

In order to examine the long run interaction between economic growth and the Islamic banking sector, we employ panel-data vector autoregressive (panel VAR) method developed by Love and Ziccino (2006). Similar to the traditional VAR model, panel VAR approach also treats all the variables in the system as endogenous.

We use a first-order VAR model:

$$X_{it} = \Gamma_0 + \Gamma_1 X_{it-1} + f_i + d_{c,t} + \varepsilon_t$$

where  $X_{it}$  is a vector of six endogenous variables ( $INF$ ,  $UNEMP$ ,  $ISLMC$ ,

*GOVEXP*, *CAPSTOCK*, *GROWTH*).  $f_i$  denotes the fixed effect and  $d_{c,t}$  is the country specific time dummy. When VAR is applied to panel data, the restriction that the underlying structure is the same for each cross-sectional unit needs to be imposed. In order to apply this restriction practically, we need to allow for “individual heterogeneity” in the levels of the variables by introducing fixed effects, denoted by  $f_i$  in the model.

As it is well known that the conventional mean-differencing approach to removing the fixed effects leads to biased coefficients, to overcome this problem we use forward mean differencing following what is also known as ‘Helmert transformation’ (Arellano and Bover, 1995). Hence the orthogonality between transformed variables and lagged independent variables is preserved and the system can be estimated using GMM (Love and Zicchino, 2006).

Later we compute the impulse response functions (IRFs) and the variance decompositions. Impulse response functions describe the response of an endogenous variable over time to a shock in another variable, whereas variance decompositions measure the contributions of each shock to the forecast error variance of each endogenous variable. Following Love and Zicchino (2006), the standard errors of the impulse response functions and hence the confidence intervals are generated with Monte Carlo simulations (1000 reps).

We use the Cholesky decomposition to compute impulse response functions. According to this decomposition, series listed earlier in the VAR order impact the other variables contemporaneously, whereas series listed later in the VAR order impact those listed earlier only with lag. Hence more exogenous variables are ordered earlier in the VAR according to this decomposition.

## 5. Empirical Results

### 5.a Summary Statistics

Table 1 shows the summary statistics of the country-year observations for our panel data. In our full sample, average real GDP is 269 US million, where Mauritania is the poorest with the smallest time series average of 5.68 US million. The highest average real GDP in our sample belongs to

Indonesia with 748 US million, followed by Turkey (with 740 US millions) and Iran (with 713 US million). GDP growth rate averages 5.4% in the full sample. While Saudi Arabia has the lowest growth rate of 3.7%, Qatar has the highest average growth rate of 11.9% while experiencing 23.2% growth in 2006. The lowest country-year growth rate in our sample belongs to Yemen with -11.1% in 2011. This the lowest growth rate in the country's recent history.

One of our main interest variables, *Islamic Deposit*, which is defined as the total Islamic banking deposits over total banking deposit has an average of 23.73%, meaning that more than one fifth of the total deposits are Islamic deposits in these countries. Mauritania has the highest average of 100% meaning that all deposits are Islamic, whereas Indonesia (1.05%) and Turkey (1.16%) have the lowest average in our sample. Not surprisingly, similar statistics are obtained with *Islamic Size*, which is defined as the total Islamic banking assets over total banking assets, averaging 22.4% in overall sample. Mauritania has the highest average of 100% meaning that all assets are Islamic, whereas Indonesia (0.89%) and Turkey (1.03%) have the lowest average in our sample. *Islamic Investment*, which is defined as the total Islamic banking financing (loans) divided by overall bank financing, reveals comparable results, overall average being 19.65%, as before Mauritania having the highest average of 100%, and Turkey (0.2%) and Indonesia (0.25%) having the lowest statistics.

Among our control variables which are determinants of economic growth, *Capital Stock* averages 4.5 US million overall, whereas *Government Expenditure*, which is defined as the share of government consumption at current purchasing power parity has an average of 14% in our full country-year sample. *Population Growth*, is 2.92% on average in the total sample, the lowest rate being in Tunisia with an average of 0.42%, whereas highest in Qatar with an average rate of 9.6%.

One other determinant of economic growth, *Unemployment*, is 10.58% in overall, while it is highest in Mauritania with an average of 31.7% and lowest in Qatar with 0.68%. *Inflation* is 10.07% on average between 1999 and 2011 in these 14 countries. Turkey has the highest average of 21.8%, whereas Tunisia has the lowest average with 3.3%. Interestingly, Qatar experienced the lowest inflation of -24.22% in 2009, which is actually a deflation.



### 5.b      ***Panel Fixed Effects Regressions***

Table 2 shows the panel fixed effects regressions, where the dependent variable is economic growth defined as the growth rate of real GDP. In Panel A, *Growth* is regressed on *Islamic Deposit*, controlling for other potential determinants of growth following the fixed effects method described in methodology. First row of Panel A reveals that *Islamic Deposit* is a positive and significant determinant of economic growth in these 14 countries after controlling for *Initial GDP*, *Population Growth*, *Capital Stock*, *Unemployment*, *Inflation*, *Offshore Banking*, *Export Value* and *Government Expenditure*. According to our results, if Islamic deposits share in total deposits (including conventional banking deposits) increases by 10%, GDP growth rate increases by 0.065%. (For instance *Growth* increases from 5% to 5.065%, with an increase in Islamic deposits share in total deposits only by 10%). Moreover, this increase is statistically significant at 1%. *Initial GDP* has the expected negative significant sign, meaning the lower the initial level of GDP, the higher the growth is. *Capital Stock* also affects economic growth positive and significantly, coherent with literature, as *Capital Stock* increases by 1% growth increases by 0.087%. In order to control for the increase in real GDP growth that is not a result of population growth, we also control for population growth. It is significantly and positively related with growth. On the other hand, *Unemployment* and *Government Expenditure* have a negative impact on economic growth. Row 2-8 of Panel A shows that the positive effect of *Islamic Deposit* on economic growth is robust to inclusion of *Agricultural Land*, *Human Capital*, *Cell Phone* and *Interest Rate*. None of these control variables have a significant relation with economic growth in our sample. Even in Row 8, after controlling for all possible determinants of growth, *Islamic Deposit* remains positive and highly significant at 1%.

Results in Panel B of Table 2 are in line with our results in Panel A. In Panel B, *Islamic Size* is employed as an explanatory variable of growth. As the share of Islamic assets in total assets increases in these countries, our results show that economic growth also increases and this is highly statistically significant at 1%. 10% increase in Islamic assets share raises the growth rate by 0.076%, after controlling for the same control variables as in Panel A. The explanatory power of control variables in Panel B is very similar to Panel A. And our main variable *Islamic Size*'s correlation with economic growth is robust to inclusion of other control variables. In

Panel C, we examine the relation between growth and *Islamic Investment*, which is mainly the share of Islamic loans to total loans in a country. Our results demonstrate that, in line with our other Islamic banking variables, an increase in the share of Islamic loans increases growth rates in the countries in our sample. A 10% increase in Islamic loans share in total loans raises the growth rate by 0.064% (from 5% to 5.064%). The significance of the results for control variables as well as the Islamic loans continues to be same as in Panel A and Panel C.

### 5.c Panel VAR

The coefficients of the Panel VAR system given in Table 3 are estimated after the fixed effects and the country year dummy variables have been removed. Panel A of Table 3 shows that growth responds significantly and positively to a shock in Islamic Deposit. It also responds significantly and positively to a shock in *Capital Stock* as well as its own. The responses to *Inflation*, *Unemployment* and *Government Expenditure* are not significant. Panel B and C demonstrate that growth also responds significantly and positively to a shock in *Islamic Size* and *Islamic Investment*. To check the importance of changes in one variable in explaining changes in other variables, we perform a variance decomposition. Variance decompositions show how important shocks on one variable are in explaining fluctuations in other variables. Table 4 reports the variance decomposition analysis for 2 years, 5 years and 10 years ahead. Variance decompositions measure the contributions of each shock to the forecast error variance of each endogenous variable. Here, we focus on the forecast error variance decomposition of growth. A shock in *Islamic Deposit*, *Islamic Size* or *Islamic Investments*, contributes 2.65%, 2.59% and 1.13% of the forecast error variance of growth in the next 2 years. The contribution of a shock in Islamic banking variables in the forecast error decomposition of growth gets bigger in magnitude 5 years ahead and 10 years ahead after the shock, as they become 3.79%, 3.44%, 1.23% and 3.79%, 3.45, 1.24, respectively. Meanwhile the contribution of growth's own shock to its forecast error decreases over time. Shocks in *Capital Stock* and *Government Expenditure* have the most input in growth's forecast error in magnitude, even though *Government Expenditure* does not have a significant impact.

In Figure 1, the graphs of the impulse-response functions and the 5% error bands generated by Monte Carlo simulations are presented. Impulse

responses give information about the effect of changes in one variable on another. Each panel evidences response of growth ( $y_6$ ) to other variables in the system. Our main variables, Islamic banking variables, are  $y_3$  in each panel. We see that growth responds positively to shocks in Islamic banking variables. Growth also responds positively to shocks in *Capital Stock* and itself, whereas the response to *Unemployment* is negative. However the Table 3 results already show this is not significant.

## 6. Concluding Remarks

We examined the link between Islamic banking and economic growth by using panel fixed effects regressions and Panel VAR model with members of the Organization of Islamic Cooperation from 1999 to 2011. According to these results, the relationship between Islamic deposit, Islamic size, and Islamic investment is significant and positive. When Islamic banking activities increase, at the same time economic growth increases. On the other hand capital stock is an important indicator of economic growth. Together, increases of capital stock, investments, and also economic growth will rise. In our study, for every one of these three regressions, the link between capital stock and economic growth is significant and positive. Moreover, another variable which effects economic growth positively is population growth. The relationship between economic growth and unemployment is negative and significant. While economic growth increases, unemployment diminishes depending on new employment opportunities. For government expenditure, in the same way there is a negative and significant relationship in relation to economic growth. It can be said that when the share of government decreases, the share of the private sector increases depending on short-run.

At the same time inflation is positive and significant in relation to economic growth in our study. It can be about the Phillips curve approach depending on the Keynesian model in the short term; with an increase of inflation, unemployment decreases. When we looked at the other control variables (human capital, agriculture, and cell phones) about human development, agriculture is significant and positive in Panel B. For the other two regressions, there is no relationship between economic growth and other indicators of human development. According to each of the three regressions lending interest rate is not significant in the sense of economic growth.

In our analysis, we applied the Panel VAR method; a positive shock on Islamic instruments (Islamic size, Islamic investment and Islamic deposit) causes economic growth to increase in the first few years for organization of Islamic cooperation countries. After 10 years, Islamic deposit explains 3.79%, Islamic investment 1.24%, and Islamic size 3.45% of the variation in growth rate. Capital stock is also an important variable for economic growth. Whereas it explains 12.21% for Islamic deposit, it indicates, respectively 12.33% and 13.81% for Islamic size and investment. And also while capital stock increases, economic growth is affected positively. In the long term initially a positive shock on government expenditure increases economic growth; however, a few years later, by diminishing the efficiency of government expenditure, economic growth becomes stationary. After 10 years while government expenditure explains 11.38% for Islamic deposit, whereas Islamic size and Islamic investment, in turn, explains 10.70% and 10.61% respectively.

Finally, Islamic finance is important to draw foreign investment into Muslim countries that has a financial services industry. Particularly, while Islamic instruments are commonly used in Malaysia, the share in other Muslim countries gradually increases. In other words Islamic banking or Islamic finance tools have shown to be effective as financial intermediaries that facilitate the transmission of funds from surplus households to deficit households. Islamic banking affects economic growth positively in short and long term for our countries. Capital stock is also an important variable in determining economic growth. While capital stock increases, investments increase. Increase of investments causes economic growth. On the other hand, the Organization of Islamic Cooperation countries stimulate especially Islamic instruments to gain capital stock; in this way, they provide resources for their physical investments. However, we can say that Islamic finance alone is not enough for economic growth. Technology and human capital indicators that help develop the economies of these countries should be emphasized as well simultaneously.

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**Table 1:** Summary of Statistics (1999-2011)

|                                  | Mean   | St. Dev | Min    | Max    | Obs |
|----------------------------------|--------|---------|--------|--------|-----|
| <b>Economic Growth</b>           |        |         |        |        |     |
| Real GDP (US \$ in millions)     | 269    | 289     | 4.39   | 1020   | 182 |
| GDP Growth (%)                   | 0.05   | 0.04    | -0.11  | 0.23   | 168 |
| <b>Financial Development</b>     |        |         |        |        |     |
| Islamic Size (%)                 | 22.40  | 32.23   | 0      | 100    | 182 |
| Islamic Deposit (%)              | 23.73  | 32.34   | 0      | 100    | 182 |
| Islamic Investment (%)           | 19.65  | 32.70   | 0      | 100    | 182 |
| Offshore Banking (%)             | 21.96  | 20.73   | 1.97   | 103.66 | 176 |
| Capital Stock (US\$ in millions) | 4.50   | 13.70   | 0.01   | 67.60  | 182 |
| <b>Real Sector</b>               |        |         |        |        |     |
| Pop. Growth (%)                  | 2.92   | 2.74    | 0.18   | 17.48  | 182 |
| Human Cap. (Per Person)          | 2.22   | 0.43    | 1.33   | 2.97   | 182 |
| Unemp. (%)                       | 10.58  | 7.61    | 0.30   | 32.50  | 182 |
| Inf. (%)                         | 10.07  | 10.66   | -24.22 | 54.18  | 180 |
| Gov. Exp. (Current PPPs)         | 0.14   | 0.05    | 0.04   | 0.31   | 182 |
| Export Value (2000=100)          | 228.11 | 158.41  | 43.17  | 985.84 | 182 |
| Cell Phone (Per 100 People)      | 52.42  | 42.99   | 0.04   | 193.45 | 182 |
| Agr. Land (%)                    | 33.95  | 23.22   | 3.31   | 80.85  | 182 |
| Int. Rate                        | 14.05  | 11.98   | 4.70   | 95.00  | 180 |

Table 1 shows the summary statistics of the full panel data. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the total Islamic banking deposit over total banking deposit. *Islamic Size* is the total Islamic banking assets over total banking assets. *Islamic Investment* is the total Islamic banking financing (loans) divided by overall bank financing. *Capital Stock* is the capital stock at 2005 constant prices. *Pop. Growth* is the population growth rate (%). *Unemp* is the unemployment rate (% total labor force). *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Offshore Banking* is the offshore bank deposits to domestic bank deposits (%). *Export Value* is the current value of exports (f.o.b.) converted to U.S. dollars and expressed as a percentage of the average for the base period (2000). *Gov. Exp* is the share of government consumption at current PPPs. *Agr. Land* is the agricultural land area divided by total land (%). *Human Cap.* is the index of human capital per person based on years of schooling and returns to education. *Cell Phone* is the mobile cellular subscriptions (per 100 people). *Int. rate* is the lending interest rate (%).

**Table 2:** Panel Fixed Effect Regressions

| Panel A. Islamic Deposit and Economic Growth |                   |                     |                       |                     |                      |                       |                   |                  |                    |                       |                  |                    |
|----------------------------------------------|-------------------|---------------------|-----------------------|---------------------|----------------------|-----------------------|-------------------|------------------|--------------------|-----------------------|------------------|--------------------|
| Dependent Variable: Growth                   |                   |                     |                       |                     |                      |                       |                   |                  |                    |                       |                  |                    |
|                                              | Constant          | Islamic Deposit     | Initial GDP           | Capital Stock       | Pop. Growth          | Unemp.                | Inf.              | Offshore Banking | Export Value       | Gov. Exp              | Agr. Land        | Human Cap.         |
| (1)                                          | 0.8805<br>[1.57]  | 0.0065<br>[3.79***] | -0.0952<br>[-3.31***] | 0.0873<br>[3.02***] | 0.0080<br>[7.85***]  | -0.0079<br>[-2.53***] | 0.0012<br>[2.01*] | 0.0004<br>[1.17] | -0.0248<br>[-1.07] | -0.3593<br>[-2.23***] |                  |                    |
| (2)                                          | 0.9220<br>[1.66]  | 0.0067<br>[3.92***] | -0.1036<br>[-3.77***] | 0.0902<br>[3.12***] | 0.0078<br>[7.42***]  | -0.0076<br>[-2.38***] | 0.0012<br>[1.91*] | 0.0004<br>[1.04] | -0.0225<br>[-0.96] | -0.4095<br>[-2.54***] | 0.0022<br>[1.2]  |                    |
| (3)                                          | 0.8814<br>[1.5]   | 0.0065<br>[3.42***] | -0.0951<br>[-3.37***] | 0.0873<br>[2.98***] | 0.0080<br>[8.66***]  | -0.0079<br>[-2.47***] | 0.0012<br>[1.85*] | 0.0004<br>[1.2]  | -0.0247<br>[-0.95] | -0.3592<br>[-2.17***] |                  | -0.0005<br>[-0.01] |
| (4)                                          | 0.8800<br>[1.64]  | 0.0065<br>[4.45***] | -0.0927<br>[-3.12***] | 0.0851<br>[2.74***] | 0.0084<br>[11.39***] | -0.0079<br>[-2.53***] | 0.0013<br>[1.97*] | 0.0005<br>[1.37] | -0.0311<br>[-1.27] | -0.3634<br>[-2.3***]  |                  | 0.0038<br>[0.98]   |
| (5)                                          | 0.8838<br>[1.53]  | 0.0064<br>[3.4***]  | -0.1053<br>[-4.04***] | 0.0930<br>[3.24***] | 0.0079<br>[8.7***]   | -0.0075<br>[-2.24***] | 0.0012<br>[1.84*] | 0.0004<br>[1.13] | -0.0255<br>[-0.99] | -0.4167<br>[-2.45***] | 0.0023<br>[1.27] | 0.0207<br>[0.34]   |
| (6)                                          | 0.9215<br>[1.73*] | 0.0067<br>[4.11***] | -0.1011<br>[-3.58***] | 0.0880<br>[2.91***] | 0.0082<br>[10.82***] | -0.0076<br>[-2.36***] | 0.0012<br>[1.89*] | 0.0005<br>[1.23] | -0.0287<br>[-1.17] | -0.4135<br>[-2.57***] | 0.0022<br>[1.23] | 0.0038<br>[0.96]   |
| Table 2 A continued                          |                   |                     |                       |                     |                      |                       |                   |                  |                    |                       |                  |                    |
| (7)                                          | 0.9674<br>[1.74*] | 0.0071<br>[3.81***] | -0.0888<br>[-2.93***] | 0.0785<br>[2.4***]  | 0.0084<br>[10.76***] | -0.0081<br>[-2.62***] | 0.0012<br>[1.87*] | 0.0005<br>[1.27] | -0.0266<br>[-1.03] | -0.3533<br>[-2.19***] |                  | -0.0456<br>[-0.72] |
| (8)                                          | 0.9749<br>[1.69]  | 0.0061<br>[3.07***] | -0.0968<br>[-3.34***] | 0.0771<br>[2.77***] | 0.0084<br>[11.52***] | -0.0074<br>[-2.58***] | 0.0012<br>[1.73*] | 0.0005<br>[1.35] | -0.0252<br>[-0.96] | -0.3649<br>[-2.28***] | 0.0027<br>[1.53] | -0.0018<br>[-0.03] |
|                                              |                   |                     |                       |                     |                      |                       |                   |                  |                    |                       |                  | 0.0032<br>[0.69]   |
|                                              |                   |                     |                       |                     |                      |                       |                   |                  |                    |                       |                  | -0.0020<br>[-0.84] |

Table 2-Panel A presents results from panel fixed effects regressions of the *Growth* on *Islamic Deposit* and other control variables. The sample period is 1999–2011. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the natural logarithm of total Islamic banking deposit over total banking deposit. *Initial GDP* is the logarithm of initial real GDP reset at 3 years intervals. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. *Pop. Growth* is the population growth rate (%). *Unemp* is the unemployment rate (% total labor force). *Inf* is the inflation rate calculated using GDP deflator (annual %). *Offshore Banking* is the offshore bank deposits to domestic bank deposits (%). *Export Value* is the natural logarithm of export values are the current value of exports (f.o.b). *Gov. Exp* is the share of government consumption at current PPPs. *Agr. Land* is the agricultural land area divided by total land (%). *Human Cap.* is the index of human capital per person. *Cell Phone* is the natural logarithm mobile cellular subscriptions (per 100 people). *Int. rate* is the lending interest rate (%). In all regressions observation number is 146 and adjusted R-square ranges between 0.255 and 0.277. The t-stats in brackets are calculated using clustered standard errors. The signs \*\*\*, \*\* and \* denote significance level at 1%, 5% and 10%, respectively.

| Panel B. Islamic Size and Economic Growth |                    |                     |                       |                     |                     |                      |                   |                  |                    |                       |                   |                    |                  |                    |
|-------------------------------------------|--------------------|---------------------|-----------------------|---------------------|---------------------|----------------------|-------------------|------------------|--------------------|-----------------------|-------------------|--------------------|------------------|--------------------|
| Dependent Variable: Growth                |                    |                     |                       |                     |                     |                      |                   |                  |                    |                       |                   |                    |                  |                    |
|                                           | Constant           | Islamic Size        | Initial GDP           | Capital Stock       | Pop. Growth         | Unemp.               | Inf.              | Offshore Banking | Export Value       | Gov. Exp              | Agr. Land         | Human Cap.         | Cell Phone       | Int. Rate          |
| (1)                                       | 1.2227<br>[2.43**] | 0.0076<br>[3.94***] | -0.1070<br>[-4.16***] | 0.0722<br>[2.64**]  | 0.0077<br>[7.12***] | -0.0068<br>[-2.16**] | 0.0012<br>[1.96*] | 0.0001<br>[0.21] | -0.0122<br>[-0.61] | -0.3434<br>[-2.61**]  |                   |                    |                  |                    |
| (2)                                       | 1.2470<br>[2.55**] | 0.0079<br>[3.39***] | -0.1159<br>[-4.74***] | 0.0766<br>[2.88***] | 0.0075<br>[6.74***] | -0.0065<br>[-2.01*]  | 0.0011<br>[1.87*] | 0.0001<br>[0.15] | -0.0104<br>[-0.52] | -0.4019<br>[-2.95***] | 0.0025<br>[1.43]  |                    |                  |                    |
| (3)                                       | 1.2080<br>[2.34**] | 0.0075<br>[3.55***] | -0.1073<br>[-4.20***] | 0.0731<br>[2.67**]  | 0.0077<br>[8.28***] | -0.0068<br>[-2.09**] | 0.0012<br>[1.80*] | 0.0001<br>[0.24] | -0.0133<br>[-0.58] | -0.3450<br>[-2.56**]  |                   | 0.0068<br>[0.12]   |                  |                    |
| (4)                                       | 1.2331<br>[2.48**] | 0.0078<br>[4.18***] | -0.1053<br>[-3.94***] | 0.0700<br>[2.33**]  | 0.0080<br>[9.66***] | -0.0068<br>[-2.14**] | 0.0012<br>[1.90*] | 0.0001<br>[0.38] | -0.0173<br>[-0.77] | -0.3456<br>[-2.67**]  |                   |                    | 0.0033<br>[0.72] |                    |
| (5)                                       | 1.1847<br>[2.33**] | 0.0074<br>[3.00***] | -0.1179<br>[-4.97***] | 0.0805<br>[3.10***] | 0.0076<br>[8.33***] | -0.0064<br>[-1.88*]  | 0.0012<br>[1.79*] | 0.0001<br>[0.27] | -0.0149<br>[-0.66] | -0.4114<br>[-2.83***] | 0.0026<br>[1.54]  | 0.0296<br>[0.44]   |                  |                    |
| (6)                                       | 1.2576<br>[2.59**] | 0.0080<br>[3.37***] | -0.1142<br>[-4.51***] | 0.0743<br>[2.62**]  | 0.0079<br>[9.23***] | -0.0065<br>[-1.99*]  | 0.0012<br>[1.82*] | 0.0001<br>[0.33] | -0.0155<br>[-0.70] | -0.4043<br>[-2.95***] | 0.0025<br>[1.47]  |                    | 0.0033<br>[0.73] |                    |
| (7)                                       | 1.3041<br>[2.62**] | 0.0083<br>[3.79***] | -0.1031<br>[-3.70***] | 0.0652<br>[2.10**]  | 0.0080<br>[9.32***] | -0.0069<br>[-2.18**] | 0.0012<br>[1.81*] | 0.0001<br>[0.34] | -0.0139<br>[-0.61] | -0.3390<br>[-2.60**]  |                   | -0.0316<br>[-0.48] | 0.0043<br>[0.80] |                    |
| (8)                                       | 1.2712<br>[2.54**] | 0.0074<br>[2.75***] | -0.1119<br>[-4.15***] | 0.0670<br>[2.70**]  | 0.0078<br>[8.26***] | -0.0064<br>[-2.15**] | 0.0011<br>[1.69]  | 0.0002<br>[0.54] | -0.0137<br>[-0.60] | -0.3570<br>[-2.65**]  | 0.0030<br>[1.86*] | 0.0152<br>[0.23]   | 0.0023<br>[0.45] | -0.0018<br>[-0.72] |

Table 2-Panel B presents results from panel fixed effects regressions of the *Growth* on *Islamic Size* and other control variables. The sample period is 1999–2011. *Growth* is the difference between natural logarithm of GDP minus its lagged value, *Islamic Size* the natural logarithm of total Islamic banking assets over total banking assets. *Initial GDP* is the logarithm of initial real GDP reset at 3 years intervals. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. *Pop. Growth* is the population growth rate (%). *Unemp* is the unemployment rate (% total labor force). *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Offshore Banking* is the offshore bank deposits to domestic bank deposits (%). *Export Value* is the natural logarithm of export values are the current value of exports (f.o.b). *Gov. Exp* is share of government consumption at current PPPs. *Agr. Land* is the agricultural land area divided by total land (%). *Human Cap.* is the index of human capital per person. *Cell Phone* is the natural logarithm mobile cellular subscriptions (per 100 people). *Int. rate* is the lending interest rate (%). In all regressions observation number is 150 and adjusted R-square ranges between 0.238 to 0.258. The t-stats in brackets are calculated using clustered standard errors. The signs \*\*\*, \*\*, and \* denote significance level at 1%, 5% and 10%, respectively.

| Panel C. Islamic Investment and Economic Growth |                     |                     |                       |                     |                     |                      |                   |                   |                    |                      |                  |                    |                    |                    |
|-------------------------------------------------|---------------------|---------------------|-----------------------|---------------------|---------------------|----------------------|-------------------|-------------------|--------------------|----------------------|------------------|--------------------|--------------------|--------------------|
| Dependent Variable: Growth                      |                     |                     |                       |                     |                     |                      |                   |                   |                    |                      |                  |                    |                    |                    |
|                                                 | Constant            | Islamic Inv.        | Initial GDP           | Capital Stock       | Pop. Growth         | Unemp.               | Inf.              | Offshore Banking  | Export Value       | Gov. Exp             | Agr. Land        | Human Cap.         | Cell Phone         | Int. Rate          |
| (1)                                             | 1.3354<br>[3.24***] | 0.0064<br>[2.96***] | -0.1133<br>[-4.86***] | 0.0726<br>[2.91***] | 0.0081<br>[8.05***] | -0.0068<br>[-2.40**] | 0.0012<br>[2.06*] | 0.0000<br>[0.05]  | -0.0131<br>[-0.85] | -0.2963<br>[-2.29**] |                  |                    |                    |                    |
| (2)                                             | 1.3596<br>[3.41***] | 0.0064<br>[2.71**]  | -0.1210<br>[-5.54***] | 0.0760<br>[3.13***] | 0.0079<br>[7.69***] | -0.0065<br>[-2.26**] | 0.0012<br>[1.97*] | 0.0000<br>[-0.01] | -0.0113<br>[-0.72] | -0.3376<br>[-2.28**] | 0.0021<br>[1.17] |                    |                    |                    |
| (3)                                             | 1.3948<br>[3.43***] | 0.0068<br>[2.85***] | -0.1108<br>[-4.57***] | 0.0684<br>[2.95***] | 0.0079<br>[8.60***] | -0.0069<br>[-2.40**] | 0.0011<br>[1.80]  | 0.0000<br>[0.08]  | -0.0086<br>[-0.53] | -0.3013<br>[-2.53**] |                  | -0.0325<br>[-0.53] |                    |                    |
| (4)                                             | 1.3278<br>[3.17***] | 0.0064<br>[2.98***] | -0.1135<br>[-4.77***] | 0.0733<br>[2.71**]  | 0.0080<br>[9.23***] | -0.0068<br>[-2.35**] | 0.0012<br>[1.89*] | 0.0000<br>[-0.01] | -0.0120<br>[-0.72] | -0.3018<br>[-2.63**] |                  |                    | -0.0009<br>[-0.18] |                    |
| (5)                                             | 1.3917<br>[3.53***] | 0.0067<br>[2.60**]  | -0.1194<br>[-5.39***] | 0.0736<br>[3.47***] | 0.0079<br>[8.72***] | -0.0065<br>[-2.21**] | 0.0011<br>[1.77*] | 0.0000<br>[-0.08] | -0.0089<br>[-0.55] | -0.3391<br>[-2.42**] | 0.0020<br>[1.14] | -0.0179<br>[-0.26] |                    |                    |
| (6)                                             | 1.3503<br>[3.30***] | 0.0065<br>[2.74**]  | -0.1212<br>[-5.39***] | 0.0769<br>[2.86***] | 0.0078<br>[8.87***] | -0.0065<br>[-2.21**] | 0.0012<br>[1.80*] | 0.0000<br>[-0.08] | -0.0099<br>[-0.59] | -0.3447<br>[-2.69**] | 0.0021<br>[1.16] |                    | -0.0011<br>[-0.22] |                    |
| (7)                                             | 1.4010<br>[3.49***] | 0.0069<br>[2.63**]  | -0.1106<br>[-4.16***] | 0.0679<br>[2.34**]  | 0.0079<br>[8.89***] | -0.0069<br>[-2.41**] | 0.0011<br>[1.82*] | 0.0000<br>[-0.07] | -0.0086<br>[-0.53] | -0.3002<br>[-2.66**] |                  | -0.0348<br>[-0.51] | 0.0002<br>[0.04]   |                    |
| (8)                                             | 1.3826<br>[3.23***] | 0.0058<br>[2.17**]  | -0.1160<br>[-4.64***] | 0.0653<br>[2.68**]  | 0.0078<br>[8.14***] | -0.0063<br>[-2.34**] | 0.0011<br>[1.67]  | 0.0000<br>[0.15]  | -0.0073<br>[-0.41] | -0.3057<br>[-2.55**] | 0.0027<br>[1.66] | 0.0056<br>[0.08]   | -0.0014<br>[-0.27] | -0.0023<br>[-0.98] |

Table 2-Panel C presents results from panel fixed effects regressions of the *Growth* on *Islamic Investment* and other control variables. The sample period is 1999–2011. *Growth* is the difference between natural logarithm of GDP minus its lagged value. *Islamic Investment* is the natural logarithm of total Islamic banking financing (loans) over overall bank financing. *Initial GDP* is the logarithm of initial real GDP reset at 3 years intervals. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. *Pop. Growth* is the population growth rate (%). *Unemp* is the unemployment rate (% total labor force). *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Offshore Banking* is the offshore bank deposits to domestic bank deposits (%). *Export Value* is the natural logarithm of export values are the current value of exports (f.o.b). *Gov. Exp* is share of government consumption at current PPPs. *Agr. Land* is the agricultural land area divided by total land (%). *Human Cap.* is the index of human capital per person. *Cell Phone* is the natural logarithm mobile cellular subscriptions (per 100 people). *Int. rate* is the lending interest rate (%). In all regressions observation number is 152 and adjusted R-square ranges between 0.235 to 0.252. The t-stats in brackets are calculated using clustered standard errors. The signs \*\*\*, \*\* and \* denote significance level at 1%, 5% and 10%, respectively.

**Table 3: Panel VAR Results**

| Response of                                            | Response to           |                         |                         |                          |                            |                          |
|--------------------------------------------------------|-----------------------|-------------------------|-------------------------|--------------------------|----------------------------|--------------------------|
|                                                        | INF<br>( <i>t-1</i> ) | UNEMP<br>( <i>t-1</i> ) | ISLMC<br>( <i>t-1</i> ) | GOVEXP<br>( <i>t-1</i> ) | CAPSTOCK<br>( <i>t-1</i> ) | GROWTH<br>( <i>t-1</i> ) |
| <b>Panel A: Effect of Islamic Deposit on Growth</b>    |                       |                         |                         |                          |                            |                          |
| <b>GROWTH (<i>t</i>)</b>                               | 0.0003                | 0.0028                  | -0.0077                 | 0.1256                   | 0.4772                     | 0.2600                   |
|                                                        | [-0.53]               | [-0.90]                 | [2.45***]               | [0.44]                   | [3.47***]                  | [2.66**]                 |
| <i>N of Obs</i>                                        | 110                   |                         |                         |                          |                            |                          |
| <i>N of Countries</i>                                  | 14                    |                         |                         |                          |                            |                          |
| <b>Panel B: Effect of Islamic Size on Growth</b>       |                       |                         |                         |                          |                            |                          |
| <b>GROWTH (<i>t</i>)</b>                               | -0.0003               | -0.0025                 | 0.008                   | 0.0977                   | 0.4730                     | 0.2490                   |
|                                                        | [-0.46]               | [-0.83]                 | [3.03***]               | [0.34]                   | [3.45***]                  | [2.55**]                 |
| <i>N of Obs</i>                                        | 114                   |                         |                         |                          |                            |                          |
| <i>N of Countries</i>                                  | 14                    |                         |                         |                          |                            |                          |
| <b>Panel C: Effect of Islamic Investment on Growth</b> |                       |                         |                         |                          |                            |                          |
| <b>GROWTH (<i>t</i>)</b>                               | -0.0003               | -0.0028                 | 0.0054                  | 0.0874                   | 0.4914                     | 0.2520                   |
|                                                        | [-0.53]               | [-0.95]                 | [2.36**]                | [0.31]                   | [3.61***]                  | [2.63**]                 |
| <i>N of Obs</i>                                        | 116                   |                         |                         |                          |                            |                          |
| <i>N of Countries</i>                                  | 14                    |                         |                         |                          |                            |                          |

Panel VAR model is estimated by using GMM and country-time and fixed effects are removed prior to estimation. Panel A shows the results where ISLMC variable is Islamic Deposit. Panel B shows the results where ISLMC variable is Islamic Size. Panel C shows the results where ISLMC variable is Islamic Investment. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the natural logarithm of total Islamic banking deposit over total banking deposit. *Islamic Size* the natural logarithm of total Islamic banking assets over total banking assets. *Islamic Investment* is the natural logarithm of total Islamic banking financing (loans) over overall bank financing. *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Unemp* is the unemployment rate (% total labor force). *Gov. Exp* is share of government consumption at current PPPs. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. Heteroskedasticity adjusted *t*-statistics are in parentheses. \*\*\* and \*\* indicates significance at 1% and 5% level, respectively.



**Table 4:** Forecast error variance decompositions of growth in Panel VAR

| <b><u>Panel A. Islamic Deposit</u></b> |      |       |       |        |          |        |
|----------------------------------------|------|-------|-------|--------|----------|--------|
| Period                                 | INF  | UNEMP | ISLMC | GOVEXP | CAPSTOCK | GROWTH |
| 2 years ahead                          | 1.85 | 2.95  | 2.65  | 10.21  | 9.80     | 72.53  |
| 5 years ahead                          | 1.92 | 2.98  | 3.79  | 11.36  | 12.22    | 67.73  |
| 10 years ahead                         | 1.94 | 2.98  | 3.79  | 11.38  | 12.21    | 67.70  |

| <b><u>Panel B. Islamic Size</u></b> |      |       |       |        |          |        |
|-------------------------------------|------|-------|-------|--------|----------|--------|
| Period                              | INF  | UNEMP | ISLMC | GOVEXP | CAPSTOCK | GROWTH |
| 2 years ahead                       | 1.88 | 2.71  | 2.59  | 9.64   | 9.93     | 73.24  |
| 5 years ahead                       | 1.98 | 2.70  | 3.44  | 10.69  | 12.34    | 68.84  |
| 10 years ahead                      | 1.99 | 2.70  | 3.45  | 10.70  | 12.33    | 68.81  |

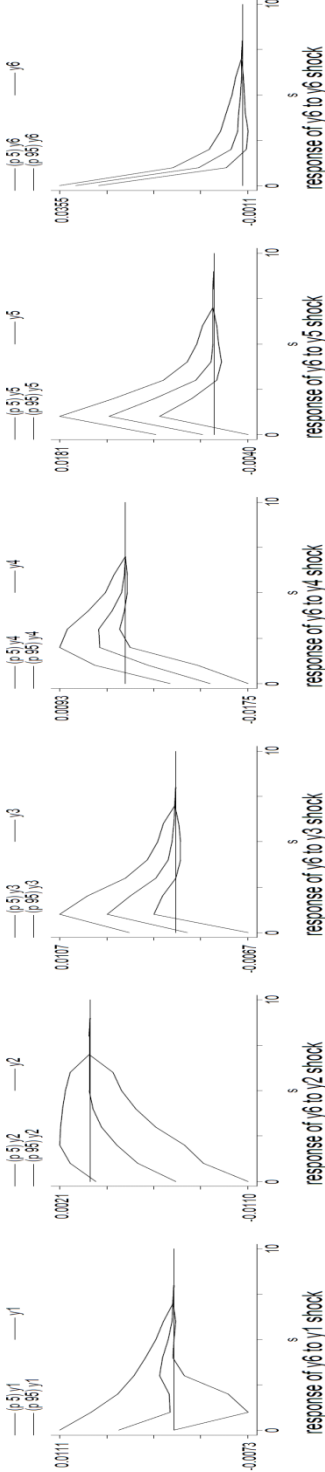
  

| <b><u>Panel C. Islamic Investment</u></b> |      |       |       |        |          |        |
|-------------------------------------------|------|-------|-------|--------|----------|--------|
| Period                                    | INF  | UNEMP | ISLMC | GOVEXP | CAPSTOCK | GROWTH |
| 2 years ahead                             | 1.92 | 2.62  | 1.13  | 9.82   | 10.93    | 73.58  |
| 5 years ahead                             | 1.96 | 2.71  | 1.23  | 10.60  | 13.81    | 69.68  |
| 10 years ahead                            | 1.98 | 2.71  | 1.24  | 10.61  | 13.81    | 69.66  |

This table summarizes error variance decompositions of economic growth. Panel A shows the results where ISLMC variable is Islamic Deposit. Panel B shows the results where ISLMC variable is Islamic Size. Panel C shows the results where ISLMC variable is Islamic Investment. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the natural logarithm of total Islamic banking deposit over total banking deposit. *Islamic Size* the natural logarithm of total Islamic banking assets over total banking assets. *Islamic Investment* is the natural logarithm of total Islamic banking financing (loans) over overall bank financing. *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Unemp* is the unemployment rate (% total labor force). *Gov. Exp* is share of government consumption at current PPPs. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. All the numbers are in percentages.

**Figure 1:** Impulse response functions of growth

**Panel A. Islamic Deposit**



**Panel B. Islamic Size**

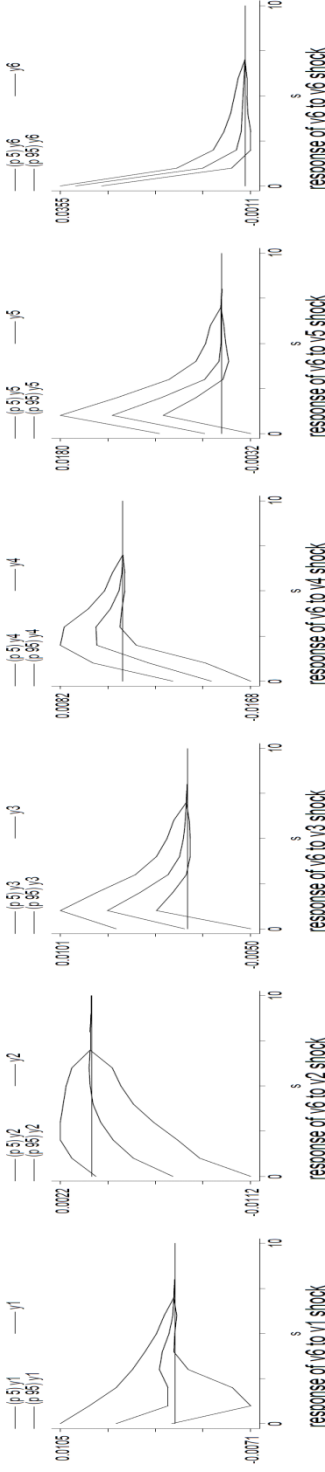


Figure 1: Continued

Panel C. Islamic Investment

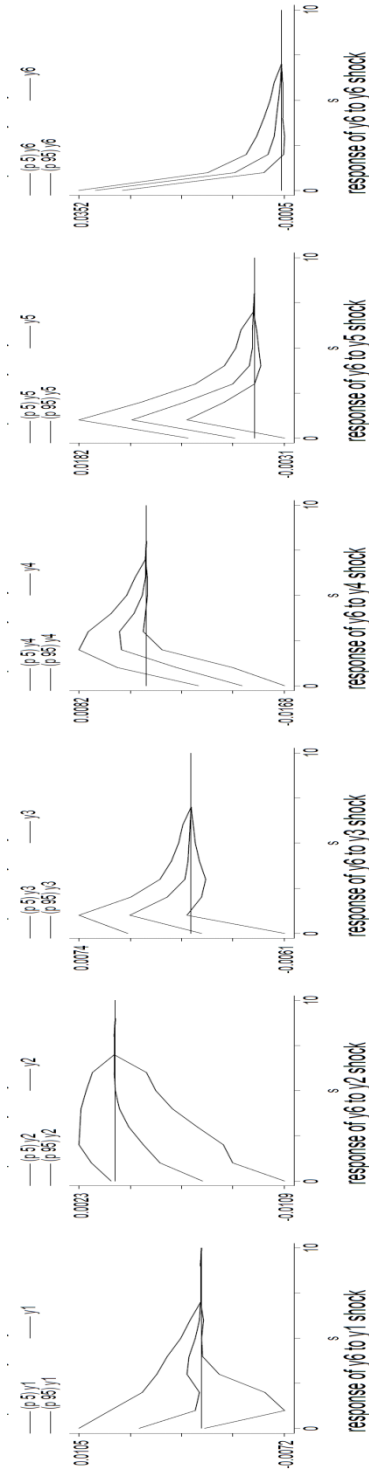


Figure 1 presents the impulse response functions of growth. Errors are 5% on each side generated by Monte-Carlo simulation with 1000 reps. y1 stands for *Inf*, y2 stands for *Unemp*, y3 stands for *Islmc*, y4 stands for *Govexp*, y5 stands for *Capstock* and y6 stands for *Growth*. Panel A shows the results where y3 is Islamic Deposit. Panel B shows the results where y3 is Islamic Size. Panel C shows the results where y3 is Islamic Investment. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the natural logarithm of total Islamic banking deposit over total banking deposit. *Islamic Size* the natural logarithm of total Islamic banking assets over total banking assets. *Islamic Investment* is the natural logarithm of total Islamic banking financing (loans) over overall bank financing. *Inf* is the inflation rate calculated using GDP deflator (annual %). *Unemp* is the unemployment rate (% total labor force). *Gov. Exp* is share of government consumption at current PPPs. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices.

## Returns Predictability in Emerging Housing Markets

Bora Özkan<sup>1</sup>, M. Kabir Hassan<sup>2</sup> and Ali Hepşen<sup>3</sup>

This essay searches for a link between house prices, broad money, private credit and the macro-economy among 19 emerging markets. We also explain which variables predict the emerging markets house price index returns. The analysis consists of data for 19 emerging markets spanning the period 1966-2012. To investigate the relationship among our variables as well as the direction of the relationship, we used Fixed-Effects Panel Data Approach, Vector Auto-Regression, Granger Causality, and Variance Decomposition analysis. Using the fixed effects panel data approach, this paper analyzes the variation in 19 emerging markets house price index returns. Our results show that money market rate, growth in GDP and CPI as well as log of private credit (D) and money supply (M3) have significant predictive power on growth in house price indices a quarter ahead. There is a strong negative correlation between the growth in house price indices and the lagged money market rates and private credit. There is a strong positive correlation between the growth in house price indices and the lagged growth in GDP, CPI and log of M3. When we look at different regions, we show that in Eastern Europe only GDP has a predictive power whereas in Asia MMR, D as well as M3 has statistically significant predictive power. Granger causality tests for each country reveals strong evidence of multi-directional link between house prices, GDP, CPI, interest rates, money, and credit. House prices significantly affect the future broad money, private credit and macro variables. When we look at the variance decomposition, in almost every country we investigated, forecast errors to GDP, CPI and money market rate play an important role in explaining innovations to the house price index returns.

### 1. Introduction

Just like any other security, real estate investment also has its risks including falling property values, lack of liquidity, limited

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diversification and sensitivity to certain economic and financial factors. The question we are looking for is if there is evidence of a significant link among house price indices, money, credit and the macro economy. Goodhart (2007) argue that modern-style macro models are inherently non-monetary. He claims “Since there are by construction no banks, no borrowing constraints and no risks of default, the risk free short-term interest rate serves to model the monetary side of the economy. As a consequence, money or credit aggregates and asset prices play no role in standard versions of these models.”

Interest rates have direct effects on house prices. House prices appear to be associated with business-cycle movements in a number of real variables, such as consumption and investment. Researchers have not fully agreed on as to whether accommodative policy has contributed to the volatility of house or other asset prices. It can be argued that because house prices, macroeconomic and monetary variables move in response to other outside shocks hitting the economy, the direction of the relationship or the extent of causality among these variables can be difficult to point out.

The main objectives of the central banks are not necessarily in line with the goals for asset prices, particularly house prices; however house price changes can have important implications for economic activity and inflation. This effect has become especially more important since 2008 crisis. The consequences of excess changes in house prices also should be watched carefully by central banks and other government agencies that regulate financial institutions for the purpose of financial stability. Even though in the past, major declines in real house prices have often been associated with economic downturns, 2008 crises showed us that the opposite is also true; economic downturn can be caused by a decline in real house prices, especially when collateral values also decline significantly.

There is not a consensus among central banks as to how to react to excess changes in house prices. Some researchers argue that we should trust the markets therefore central banks should continue focusing on their goal of low inflation and output stability. However, there are also several researchers who claim central banks should act to prevent bubbles in house prices to avoid financial as well as macroeconomic turbulences. The question is then how should central banks respond to

movements in asset prices? There is also not a consensus on this question. Some researches advise that the price index targeted by a central bank should also include the future prices of goods and services as well as assets. Some researchers, on the other hand, argue that as long as the asset prices affect the forecast of future goods and services price inflation, they can be subject to the monetary policy. They claim central banks should respond to changes in asset prices by calculating the effect of the change in asset prices on expected inflation, and then adjusting the interest rates. Several researchers also point out that the changes in asset prices have implications for the stability of the financial sector; therefore there is an indirect relationship with monetary policy as well. If there is a bubble in asset prices, a correction might be inevitable. When the correction occurs it can be very costly to financial institutions therefore can impair the financial stability. It is clear that understanding the sources of asset price movements becomes a key element in determining the necessary monetary policy response. Hence, movements of house prices and the how these movements effect the financial sector and the macro-economy should closely be monitored by monetary authorities and financial regulators.

Using the fixed effects panel data approach, we analyze the variation in 19 emerging markets house index returns. The results show that money market rate as well as growth in GDP, Consumer Price Index, private credit and money supply have significant predictive power on growth in house price indices a quarter ahead. Using Vector Autoregression Model (VAR) methodology, the findings are expected to contribute to the evaluation of the emerging markets house price index behavior taking into consideration of several financial and economic factors.

Granger Causality tests reveal strong evidence of multi-directional causality between house prices, GDP, CPI, interest rates, money, and credit. In almost every country we investigated, forecast errors to GDP, CPI and money market rate play an important role in explaining innovations to the house price index returns.

The rest of the study is outlined as follows. Section II conducts a literature review. Section III explains the data as well as the variables used. Section IV outlines the framework of the methodology used in this study. Section V presents the conclusion of the study.

## 2. Literature Review

The academic studies primarily focus on the link between the housing sector and its economy. Using a vector autoregressive (VAR) model Baffoe-Bonnie (1998) tries explaining the relationship between house prices and macroeconomic key aggregates in US sub-regions. He finds that variables influence very differently across these sub-regions. Kasparova and White (2001) examine the housing markets in selected European countries using VECM. They show that effect of house prices on GDP is significantly greater than the effect of GDP on house prices. Tsatsaronis and Zhu (2004) investigate the impact of GDP, inflation and the interest rates over house prices. They show that the main reason behind the changes in house prices is the inflation hedge characteristics of residential real estate. They also show that the importance of interest rates became more obvious in the last decade of their study.

In a Federal Reserve Bank International Finance Discussion Paper (2005), Aherane et al. found that in 18 major industrial countries real house prices are pro-cyclical and they move together with real GDP, consumption, investment, CPI inflation, budget and current account balances, and output gaps. They show that house price booms are preceded by a period of easing monetary policy. After a period of rising inflation, monetary authorities begin to tighten policies before house prices peak.

Goodhart and Hoffman (2008) show that there is evidence of a significant multidirectional link between house prices, broad money, private credit and the macro economy among 17 industrialized countries. Their main results reveal that there is evidence of a significant multidirectional link between house prices, monetary variables and the macro-economy. Their results also suggest that the link between housing prices and monetary variables is stronger over more recent years and that the effects of shocks to money and credit are stronger when housing prices are booming. In a more recent study, Beltratti and Morana (2010) suggested countries that macroeconomic variables, such as interest rates and monetary aggregates, affect housing prices in G7 countries.

Asset-price volatility is believed to have been critically affected by the macro-economy (Gilchrist and Leahy, 2002). Several researches show that the housing market has a significant connection with the

performance of the overall economy and with monetary policy (Darrat and Glascock, 1989; Ball, 1994; Baffoe-Bonnie, 1998; Lastrapes, 2002; Jin and Zeng, 2004, Goodhart and Hofmann, 2008). Darrat and Glascock (1989) examined the causal relationship between money supply and real estate return and found that money supply plays an important role in changes in real estate return. Breedon and Joyce (1992) added gross financial wealth into their housing price model. They claim that money supply has a lagged effect on current real estate returns, implying a possible rejection of market efficiency. More recent studies have discussed how the relationship between money supply and asset investment leads to strong housing price fluctuation. Lastrapes (2002) used VAR model to estimate the dynamic response of housing prices to money supply shocks and interpreted these responses based on the asset view of housing demand. Jin and Zeng (2004) found that monetary policy and nominal interest rates play a significant role in the determination of housing prices, as do money shocks by generating remarkably volatile residential investment.

Kim (2005) looked at differential effects of monetary policy on housing sub-markets, specifically new home construction and existing home sales. Findings show that the existing home sale market is relatively more affected by expansionary monetary policies than is the new home construction market in the short run.

McCue and Kling (1994) examine the relationship between US equity REIT series returns and a set of macroeconomic variables. The findings indicate that nearly 60% of the variation in real estate prices is explained by the macro economy; thereby it is the nominal short-term interest rate variable that explains the majority of the real estate price movement. In a more recent study by Ewing and Payne (2005), it is found that shocks to monetary policy, economic growth, and inflation have negative impact on expected REIT returns, while on the other hand shocks to the default risk premium have positive impact on future expected returns. Mei and Lee (1994) found the presence of a real estate factor, in addition to both a stock factor and a bond factor in asset pricing. They suggest that mutual fund managers should consider including real estate assets in their portfolios.

McMillen (2007) points out the development and increasing usage of Islamic finance for real estate funds. Ahmed (2010) looks at the global



financial crisis from an Islamic finance perspective and gives examples of real estate financing alternatives in Islamic finance. As the financial crises became global as states by Ali (2012), it started to effect Islamic banks and financial institutions as well due to their asset concentration in real estate sector.

Rahman and Shahimi (2010) show that the significant role of financing structure when controlled for macro variables does not hold for small-open developing economies like Malaysia.

Gyourko and Keim (1992) found evidence that REIT returns in the US stock market predict returns to un-securitized returns to commercial properties. They concluded that the prior year's REIT return is significant in predicting the current year's un-securitized real estate return. Myer and Webb (1993) also analyzed the lead-lag relationship using Granger causality. Their findings show that equity REITs Granger cause un-securitized real estate returns. Quan and Titman (1999) prove that real estate is positively affected by inflation as well as GDP.

Ray and Vani (2003) prove that interest rates, industrial production, money supply, inflation and exchange rates have significant affect over equity prices. Hoesli et al. (2008) present the inflation characteristics of real estate investment in the United Kingdom as well as the United States. They show a positive relationship between commercial real estate returns and expected inflation in both countries.

Schatz and Sebastian (2009) find a positive linkage between the property markets and consumer prices as well as the government bonds, while the property markets are negatively affected by the respective unemployment rates for Germany and the UK. Schatz (2009) examines the issue of whether real estate stock indices are primarily driven by the progress of property markets or by developments on general stock markets for the US and the UK. He shows that the real estate equity markets are predominantly driven by the underlying properties.

### **3. Data and Variables**

Emerging markets house price index data for 19 Emerging Markets (see Appendix A) provided by Reidin.com; Bulgaria, Czech Republic, Estonia, Hong Kong Sar, Hungary, Israel, Indonesia, Lithuania, Latvia,

Mexico, Malaysia, Poland, Romania, Russia, Slovenia, Slovak Republic, South Africa, South Korea, Thailand, and Turkey. The sample period ranges from 1966Q1 to 2012Q2 which makes an unbalanced panel data set with a total of 906 quarters. On average there are 47 quarters per country; South Africa has the longest sample period with 186 quarters, whereas Thailand has the shortest with 18 quarters. The details of each country period are provided in the Appendix A.

The below table (Table 1) shows the summary statistics which are computed as the averages of each country  $i$ 's time-series statistics.  $RE_{i,t}$  is the quarterly growth of the house price indices of 19 emerging countries provided by REIDIN.com;  $GDP_{i,t}$  is the quarterly growth of GDP;  $MMR_{i,t}$  is the level of quarterly Money Market Rate;  $CPI_{i,t}$  is the growth of Consumer Price Index;  $D_{i,t}$  is the log of private credit and  $M3_{i,t}$  is the log of money supply. Panel A is the summary statistics of all 19 countries. Panel B is the summary statistics of 11 Eastern European emerging countries; Turkey, Bulgaria, Russia, Czech Republic, Slovak Republic, Estonia, Latvia, Hungary, Lithuania, Slovenia, and Poland. Panel C is the summary statistics of 5 Asian emerging countries; Hong Kong, Indonesia, South Korea, Malaysia, and Thailand.

Other variables are obtained from IFS and OECD. Missing variables are found from each country's central bank or other official resources. The variables that we used are; the growth of house price indices, the growth of real GDP, the growth of consumer price index, the level of the short-term nominal interest rate, the log of nominal broad money and the log of nominal private credit.

**Table 1: Summary Statistics**

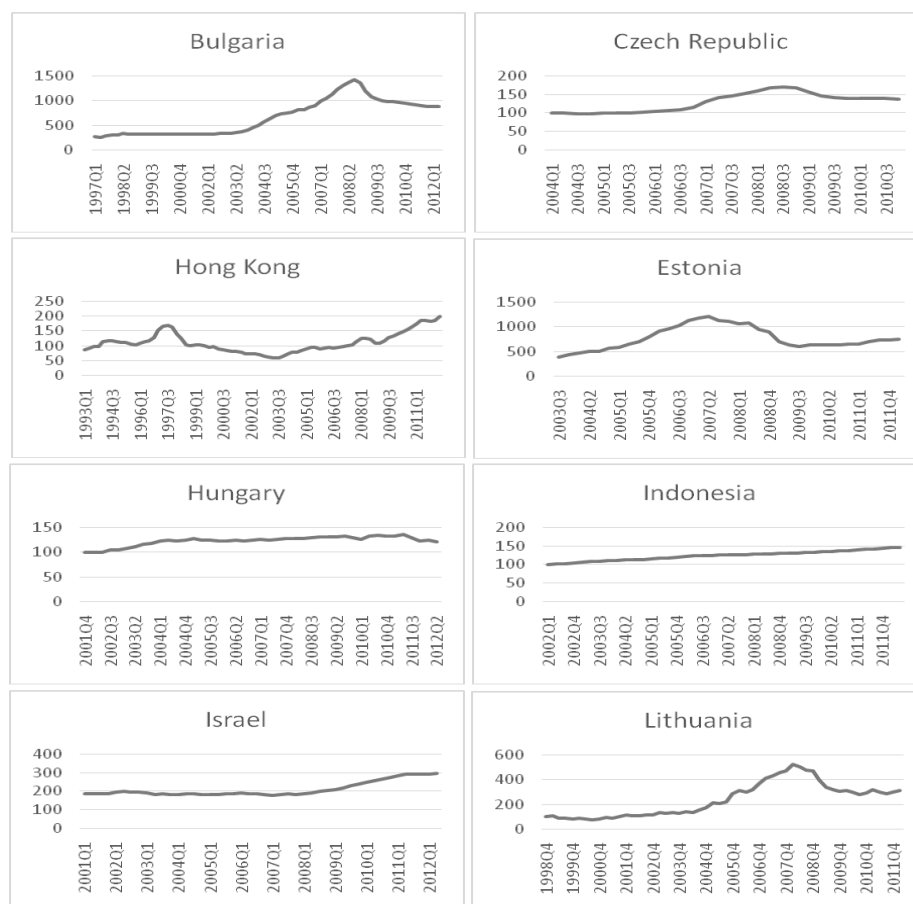
| <b>Panel A – All Countries</b>  |           |            |            |            |          |           |
|---------------------------------|-----------|------------|------------|------------|----------|-----------|
| <b>Variable</b>                 | <b>RE</b> | <b>GDP</b> | <b>MMR</b> | <b>CPI</b> | <b>D</b> | <b>M3</b> |
| Mean                            | 0.017     | 0.012      | 6.208      | 0.014      | 11.012   | 5.841     |
| Standard deviation              | 0.048     | 0.078      | 7.981      | 0.019      | 2.301    | 3.977     |
| Minimum                         | -0.233    | -0.326     | 0.060      | -0.034     | 6.686    | -0.704    |
| Maximum                         | 0.389     | 0.303      | 196.153    | 0.383      | 14.554   | 17.031    |
| Observations N                  | 906       | 901        | 904        | 906        | 713      | 800       |
| Observations n                  | 19        | 19         | 19         | 19         | 18       | 17        |
| Observations T-bar              | 47.684    | 47.421     | 47.579     | 47.684     | 39.611   | 47.059    |
| <b>Variable</b>                 | <b>RE</b> | <b>GDP</b> | <b>MMR</b> | <b>CPI</b> | <b>D</b> | <b>M3</b> |
| <b>Panel B – Eastern Europe</b> |           |            |            |            |          |           |
| Mean                            | 0.019     | 0.013      | 4.838      | 0.014      | 9.910    | 6.840     |
| Standard deviation              | 0.063     | 0.103      | 10.891     | 0.024      | 1.925    | 2.410     |
| Minimum                         | -0.233    | -0.326     | 0.100      | -0.024     | 6.686    | 3.285     |
| Maximum                         | 0.389     | 0.303      | 196.153    | 0.382      | 13.716   | 10.993    |
| Observations N                  | 380       | 379        | 373        | 380        | 254      | 330       |
| Observations n                  | 11        | 11         | 11         | 11         | 10       | 11        |
| Observations T-bar              | 34.556    | 34.455     | 33.909     | 34.545     | 26.400   | 30.00     |
| <b>Panel C – Asia</b>           |           |            |            |            |          |           |
| <b>Variable</b>                 | <b>RE</b> | <b>GDP</b> | <b>MMR</b> | <b>CPI</b> | <b>D</b> | <b>M3</b> |
| Mean                            | 0.011     | 0.015      | 5.718      | 0.010      | 11.090   | 7.698     |
| Standard deviation              | 0.038     | 0.071      | 4.332      | 0.013      | 2.561    | 5.685     |
| Minimum                         | -0.169    | -0.228     | 0.060      | -0.034     | 7.136    | 1.450     |
| Maximum                         | 0.191     | 0.173      | 23.927     | 0.103      | 14.083   | 17.013    |
| Observations N                  | 268       | 265        | 270        | 268        | 234      | 209       |
| Observations n                  | 5         | 5          | 5          | 5          | 5        | 3         |
| Observations T-bar              | 53.600    | 53.000     | 54.000     | 53.600     | 46.800   | 69.667    |

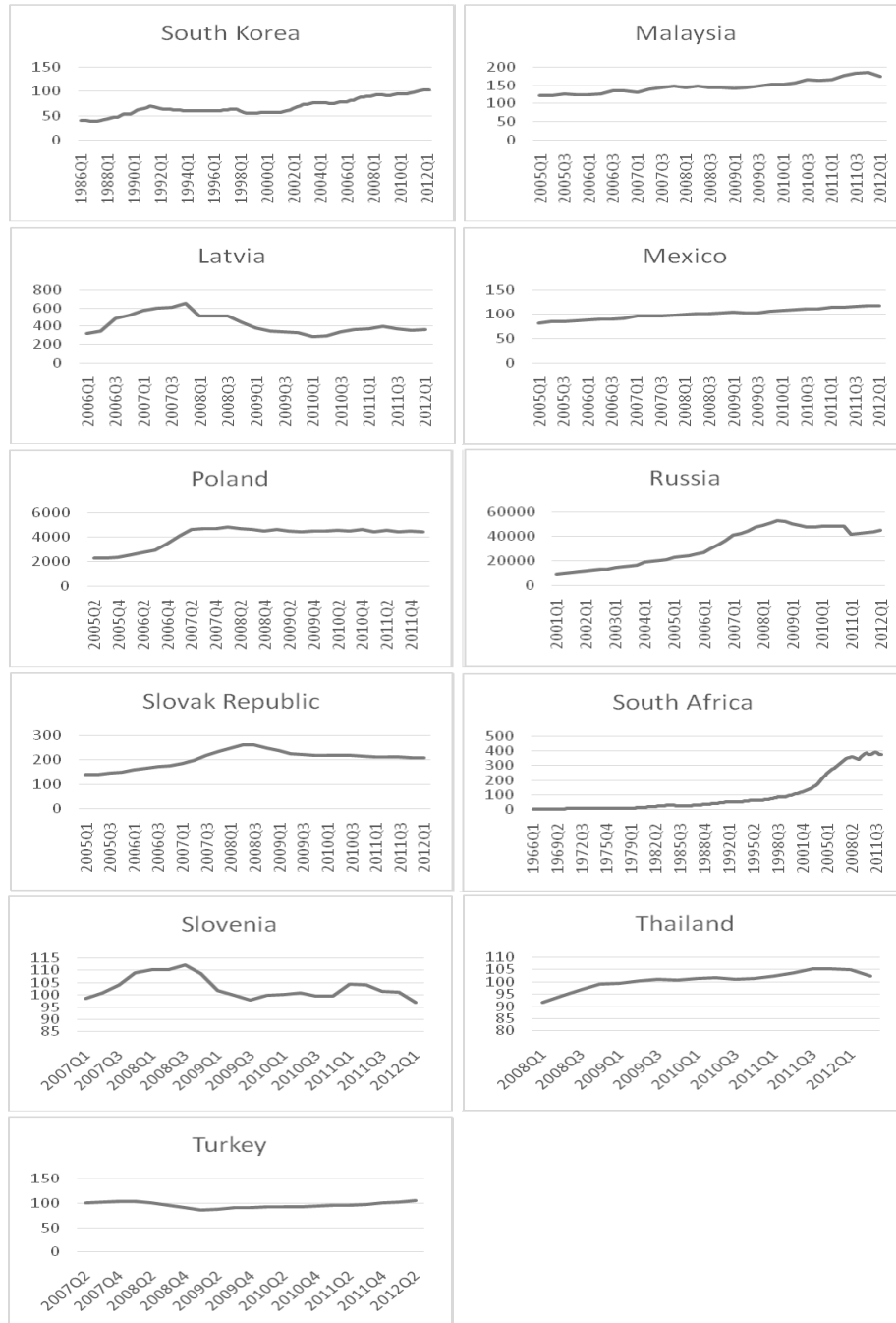
Table 1 shows the summary statistics of the country level data which are computed as the averages of each country's time-series statistics. Mean, standard deviation, minimum and maximum values and observation details are reported for the data set. Panel A is the summary statistics of all 19 countries. Panel B is the summary statistics of 11 Eastern European emerging countries; Turkey, Bulgaria, Russia, Czech Republic, Slovak Republic, Estonia, Latvia, Hungary, Lithuania, Slovenia, and Poland. Panel C is the summary statistics of 5 Asian emerging countries; Hong Kong, Indonesia, South Korea, Malaysia, and Thailand. Table 1 show that the mean growth of the 19 emerging markets house price indices is 0.017, while the growth rate is lower in Asian emerging countries; it is actually higher in Eastern European emerging countries.

The below figures (Figure 1) show the quarterly house price indices of 19 emerging markets. It is expected to see a positive trend in house price due to growing populations. Land is an important factor in housing obviously and is in fixed supply, therefore housing becomes relatively scarce, and the relative price rises. While some countries show a continuous growth in their study periods, others show busts and booms.

**Figure 1: House Price Indices in Emerging Countries**

These graphs display quarterly house price indices in 19 Emerging Countries

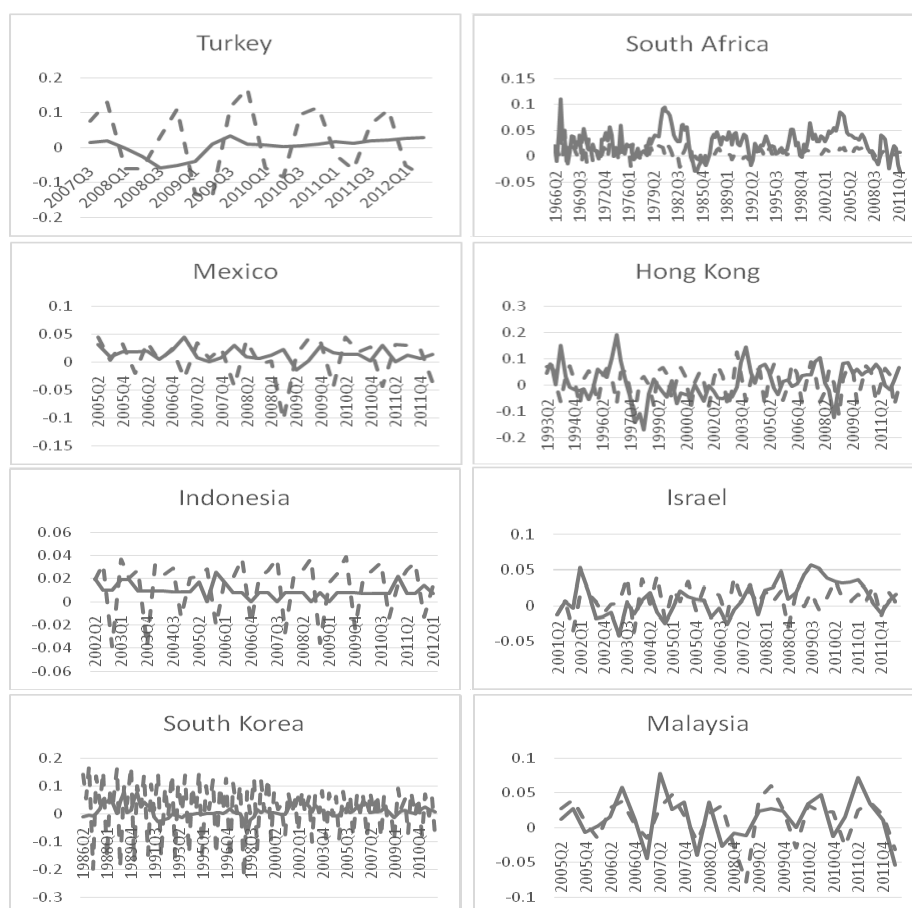


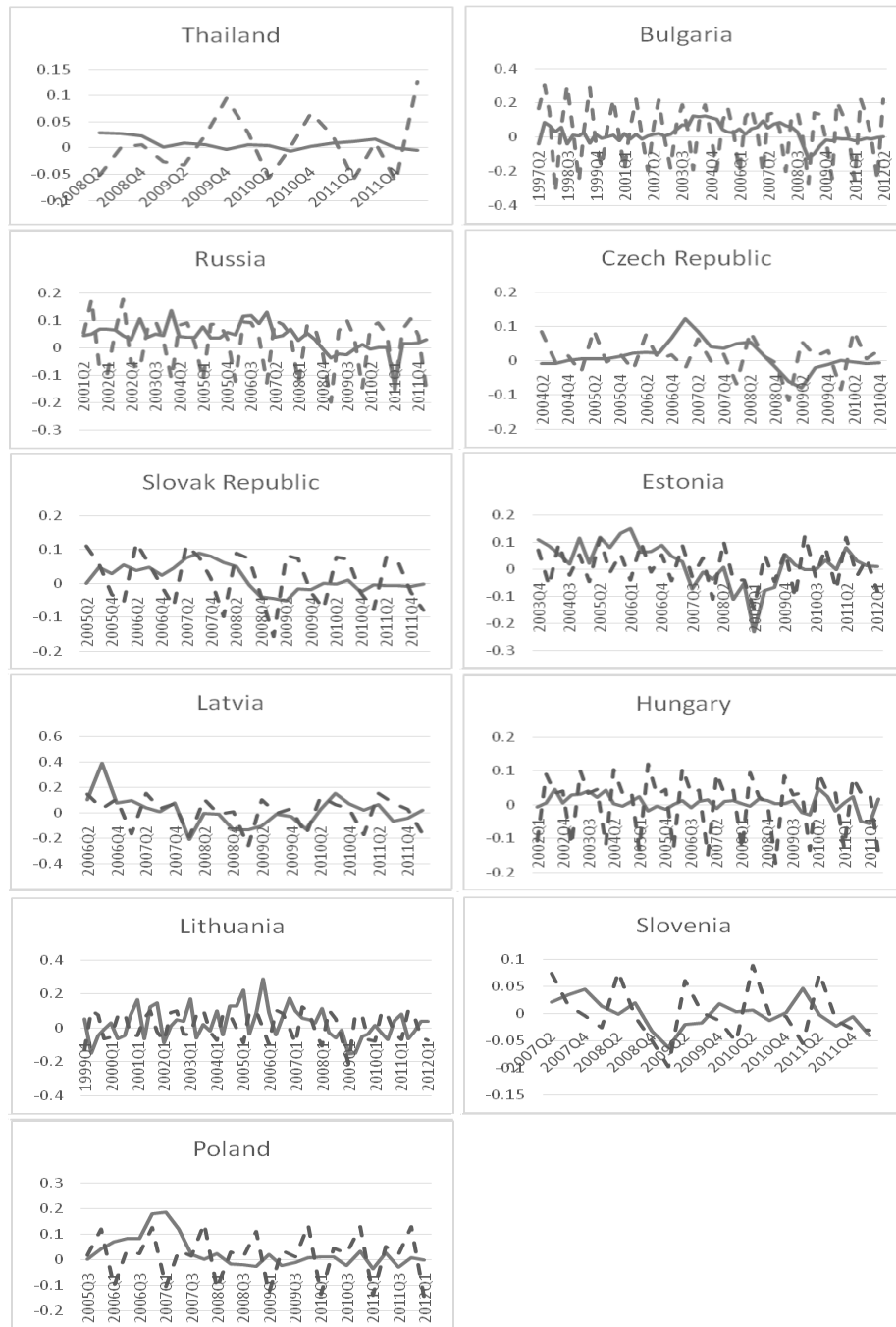


The below figures (Figure 2) show the quarterly percent change in house price indices (solid line) and the quarterly percent change in real GDP (dotted line) in 19 emerging markets.

**Figure 2.** House Price and GDP Growth in Emerging Countries

These graphs display quarterly percent change in house price indices (solid line) and real GDP (dotted line)

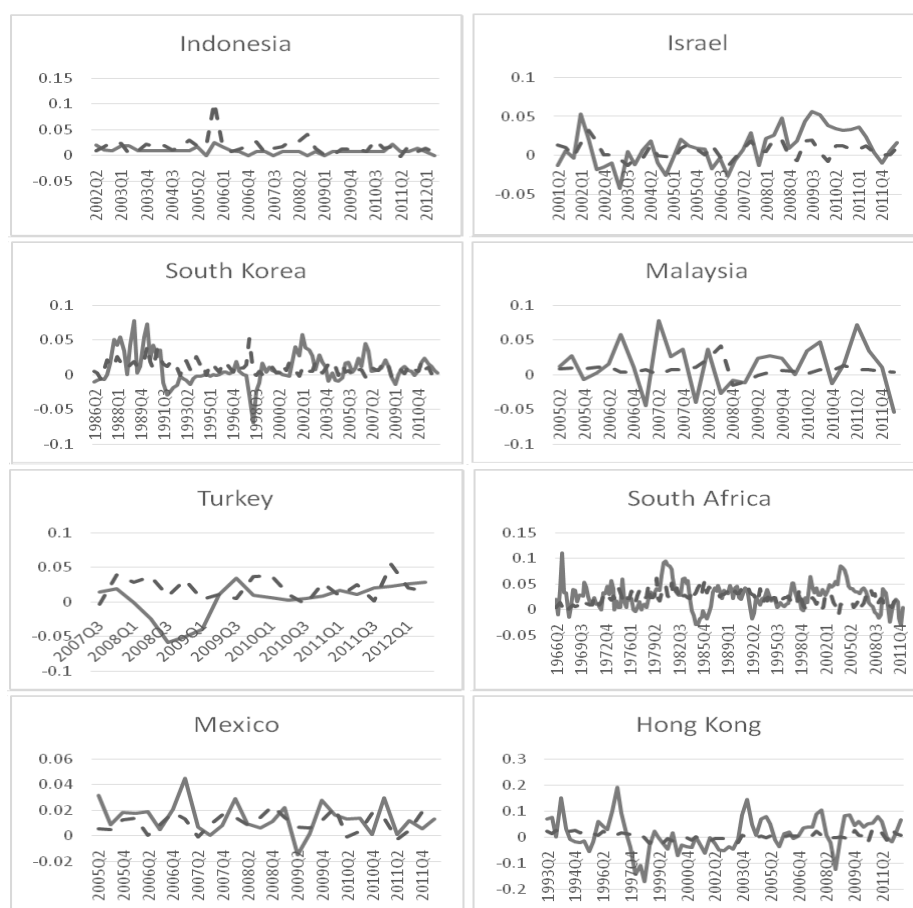




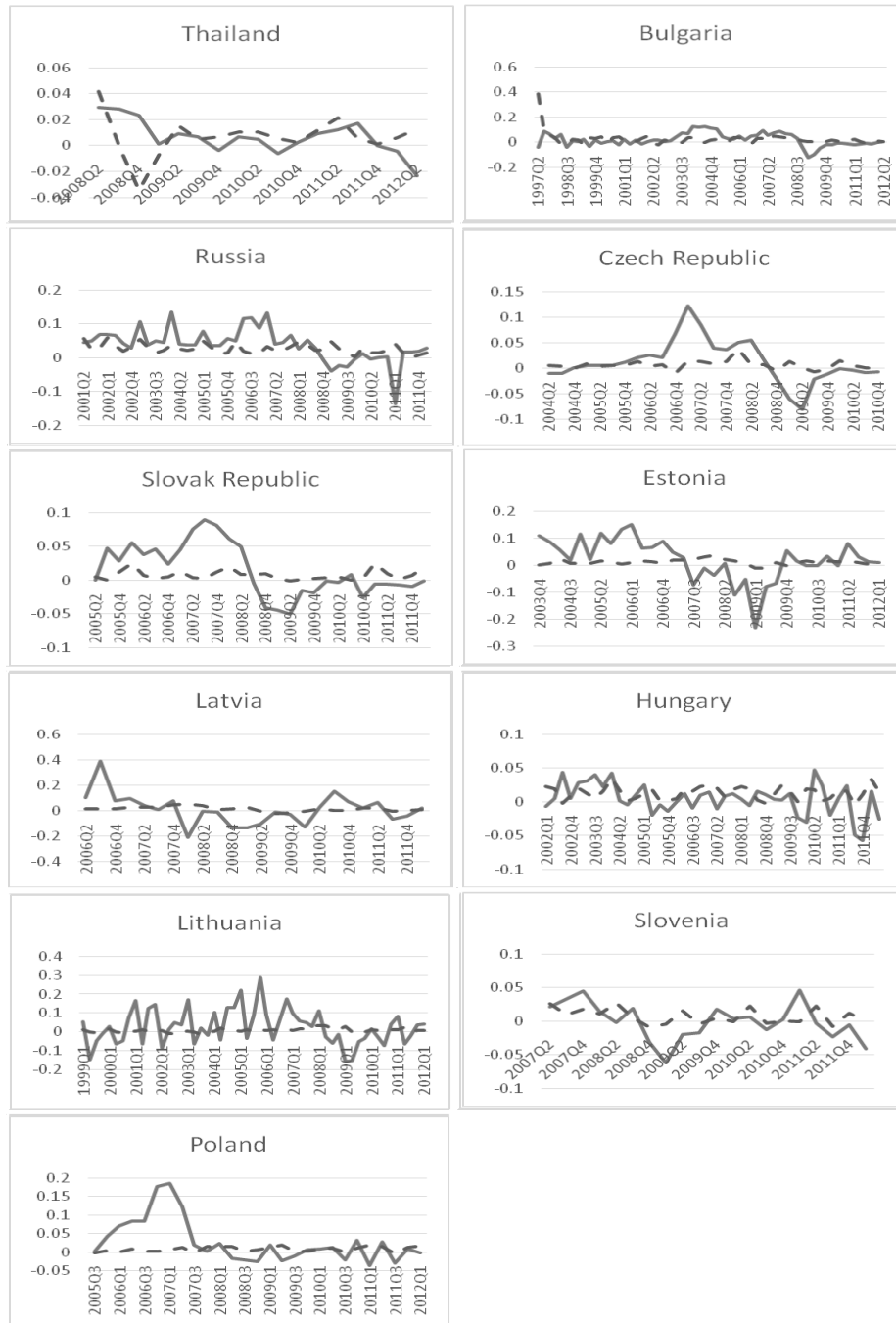
On the other hand, figure 3 shows the quarterly percent change in house price indices (solid line) and the quarterly percent change in CPI (dotted line) in our sample countries.

**Figure 3.** House Price and CPI Growth in Emerging Countries

These graphs display quarterly percent change in house price indices (solid line) and CPI (dotted line)







The figures reveal that, while there might be a correlation between growth in house indices and GDP as well as CPI, the relationship is not perfect at all. Growth in house prices in some countries move in the same direction with growth in GDP, However, several countries also show a deviation in the direction of this relationship. The similar pattern is also found in the relationship between the growth in house price indices and the growth in CPI in these countries. This also means that there will not be a major multicollinearity problem including these variables in our empirical model.

#### 4. The Theoretical Framework

##### 4.1. Predictability of House Price Index Returns

###### 4.1.1. Parameter Estimates

The fixed-effects panel data regression shows the relationship between the House Price Index returns and the independent variables; gross domestic product (GDP), money market rate (MMR), consumer price index (CPI), private credit (D) and money supply (M3).

$$r_{j,t} = \alpha_j + \beta Z_{j,t} + \varepsilon_{j,t} \quad (1)$$

$r$  is index return for country  $j$  at time  $t$  and independent variables for country  $j$  are defined by  $Z$  at time  $t$ .

The below table (Table 2) shows the parameter estimates and standard errors for house price index returns from the fixed effects regression results with clustered standard errors. In the regression, dependent variable is the quarterly growth on the house price indices of 19 emerging countries provided by REIDIN.com;  $RE_{i,t}$ . Independent variables are growth of  $GDP_{i,t}$ , level of Money Market Rate  $MMR_{i,t}$ , growth of Consumer Price Index  $CPI_{i,t}$ , log of private credit  $D_{i,t}$  and log of money supply  $M3_{i,t}$ . Standard errors are reported in parenthesis. \*, \*\*, \*\*\* indicate significance at the 10%, 5% and 1% level, respectively.

**Table 2.** Fixed Effects Panel Regressions

| Constant | GDP     | MMR       | CPI      | D         | M3       | R <sup>2</sup> |
|----------|---------|-----------|----------|-----------|----------|----------------|
| 0.294*** | 0.035   | -0.002*** | 0.270*** | -0.055*** | 0.059*** | 0.16           |
| (0.079)  | (0.053) | (0.001)   | (0.100)  | (0.016)   | (0.016)  |                |

Table 2 shows the parameter estimates and standard errors for house price index regression results. Results show that all of the coefficients, except for GDP, are statistically significant at 1% level. Money market rate, growth in CPI, private credit and M3 are all positively correlated with the growth in house price index returns. Coefficient signs also seem to be in line with the current literature on house in developed countries. Quan and Titman (1999) and Hoesli et al. (2008) found positive relationship between house returns and anticipated inflation in the US and the UK. McCue and King (1994) claim that nominal short term interest rate explains majority of the variation in house series.

#### 4.1.2. Forecasting House Price Index Returns

To test whether house prices, credit, money and economic activity can predict one-quarter-ahead market returns in emerging countries, fixed-effects panel data regression is used.

$$r_{j,t+1} = \alpha_j + \delta X_{j,t} + \xi_{j,t+1} \quad (2)$$

$r$  is index return for country  $j$  at time  $t+1$  and independent variables for country  $j$  are defined by  $X$  at time  $t$ . The lagged dependent variable is also added as a control variable. As stated by Ferson et al. (2003), persistent dependent variables may result in a spurious regression. In panel data, the variance-covariance matrix of the error terms is simply the combination of variance-covariance matrices of each country which, aside from the autocorrelation of the error terms within each country, causes a contemporaneous cross-sectional correlation. This can inflate the  $t$ -statistics by a significant amount. To correct this, we compute standard errors in the existence of heteroskedasticity and contemporaneous cross-correlations as suggested by Rogers (1983, 1993). By estimating intercepts,  $\alpha$ , separately for each country  $j$ , we lower to the country-level data and make sure that each country's error term is orthogonal to the explanatory variables for that country.

Therefore, in a panel data using fixed effects regression, the results reject the time-series relation between the dependent and independent variables. In equation (2), the slope coefficient,  $\delta$ , together with its clustered standard errors, shows whether there is a statistically significant relation between the house price index returns and broad money, private credit and macro economy.

The below table (Table 3) shows the parameter estimates and standard errors for house price index returns from the fixed effects regression results with clustered standard errors. In the regression, dependent variable is the lead quarterly growth of the house price indices of 19 emerging countries provided by REIDIN.com;  $RE_{i,t+1}$ . Independent lagged variables are growth of the house price index;  $RE_{i,t}$ , growth of  $GDP_{i,t}$ , level of Money Market Rate  $MMR_{i,t}$ , growth of Consumer Price Index  $CPI_{i,t}$ , log of private credit  $D_{i,t}$  and log of money supply  $M3_{i,t}$ . Clustered standard errors are reported in parenthesis. \*, \*\*, \*\*\* indicate significance level at the 10%, 5% and 1%, respectively.

**Table 3.** Forecasting House Price Index-Fixed Effects Panel Regressions

|   | Constant |         | GDP     | MMR     | CPI     | D       | M3      | $R^2$ |
|---|----------|---------|---------|---------|---------|---------|---------|-------|
| 1 | 0.016*** |         | 0.053   |         |         |         |         |       |
|   | (0.003)  |         | (0.038) |         |         |         |         |       |
| 2 | 0.021*** |         |         | -       |         |         |         |       |
|   | (0.003)  |         |         | (0.001) |         |         |         |       |
| 3 | 0.015*** |         |         |         |         |         |         |       |
|   | (0.003)  |         |         |         | (0.066) |         |         |       |
| 4 | 0.042*   |         |         |         |         | -0.002  |         |       |
|   | (0.024)  |         |         |         |         | (0.002) |         |       |
| 5 | 0.029*** |         |         |         |         |         | -0.002* |       |
|   | (0.006)  |         |         |         |         |         | (0.001) |       |
| 6 |          |         |         | -       | 0.216*  | -       |         |       |
|   | (0.058)  | (0.062) | (0.024) | (0.001) | (0.130) | (0.011) | (0.022) |       |

Table 3 shows the univariate regression of the one quarter ahead house price index returns on growth of GDP, level of MMR, growth of CPI,

log of D and log of M3. Second row shows that the money market rate is negatively correlated with the future growth in house price index returns at 5% significance level with a t-statistics of -2.56 when it is regressed alone. Growth in money supply, M3, as seen in row five, is also negatively correlated with the future growth in house price index returns at 10% level with a t-statistics of -1.74 when it is regressed alone. Both variables have statistically significant predictive power. On the other hand, third row reveals that growth in CPI is positively correlated with the future growth in house price index returns at 1% level with a t-statistics of 2.67. CPI has a strong predictive power. When we regress all of the variables together, we see that all of our variables significantly predicts the growth in house price index returns. Interestingly in this setting, GDP and private credit have forecasting power so they are statistically significant as opposed to when they were regressed by themselves. The coefficient of GDP is 0.061 with a t-statistics of 2.54, whereas the coefficient of D is -0.037 with a t-statistics of -3.32. This means that when there is a positive growth in private credit, the house price indices tend to be negatively affected from this the following quarter. We explain this by the lack of organized mortgage markets in emerging markets as well as the structure of financial institutions. When private credit to businesses increase, available money to the housing markets might be declining therefore affecting the growth in prices negatively. Our results show that there is a strong negative correlation between the growth in house price indices and the lagged money market rates and private credit. There is a strong positive correlation between the growth in house price indices and the lagged growth in GDP, CPI and log of M3.

We also examine if the predictive power of these variables is different for different regions. When we do regression one quarter ahead house price index returns on our money, credit and macro variables in Eastern European emerging markets and Asian emerging markets in our sample, we actually get different results. Table 4 reveals that in Eastern Europe, only GDP has predictive power a quarter ahead at 5% significance level. The other variables are not statistically significant even at 10% level. However in Asian emerging countries, money market rate, private credit and money supply have significantly predictive power at 1% level.

The below table (Table 4) shows the parameter estimates and standard errors for house price index returns from the fixed effects regression

results with clustered standard errors. In the regression, dependent variable is the lead quarterly growth of the house price indices provided by REIDIN.com;  $RE_{i,t+1}$ . Independent lagged variables are growth of the house price index;  $RE_{i,t}$ , growth of  $GDP_{i,t}$ , level of Money Market Rate  $MMR_{i,t}$ , growth of Consumer Price Index  $CPI_{i,t}$ , log of private credit  $D_{i,t}$  and log of money supply  $M3_{i,t}$ . Panel A is the fixed effects regression results of 11 Eastern European emerging countries; Turkey, Bulgaria, Russia, Czech Republic, Slovak Republic, Estonia, Latvia, Hungary, Lithuania, Slovenia, and Poland. Panel B is the fixed effects regression results of 5 Asian emerging countries; Hong Kong, Indonesia, South Korea, Malaysia, and Thailand. Clustered standard errors are reported in parenthesis. \*, \*\*, \*\*\* indicate significance level at the 10%, 5% and 1%, respectively.

**Table 4.** Forecasting House Price Index for Different Regions

| <b>Panel A - Fixed Effects Panel Regression for Eastern Europe</b> |           |            |            |            |          |           |                      |
|--------------------------------------------------------------------|-----------|------------|------------|------------|----------|-----------|----------------------|
| <b>Constant</b>                                                    | <b>RE</b> | <b>GDP</b> | <b>MMR</b> | <b>CPI</b> | <b>D</b> | <b>M3</b> | <b>R<sup>2</sup></b> |
| 0.140*                                                             | 0.458**   | 0.083*     | -0.001     | 0.261      | -0.037   | 0.037     | 0.3                  |
| (0.075)                                                            | (0.079)   | (0.039)    | (0.002)    | (0.266)    | (0.034)  | (0.045)   |                      |
| <b>Panel B - Fixed Effects Panel Regression for Asia</b>           |           |            |            |            |          |           |                      |
| <b>Constant</b>                                                    | <b>RE</b> | <b>GDP</b> | <b>MMR</b> | <b>CPI</b> | <b>D</b> | <b>M3</b> | <b>R<sup>2</sup></b> |
|                                                                    | 0.484**   | 0.006      | -          | 0.094      | -        | 0.050**   | 0.4                  |
| (0.063)                                                            | (0.084)   | (0.024)    | (0.001)    | (0.182)    | (0.016)  | (0.016)   |                      |

#### 4.2. Relationship among House Prices, Credit, Money and Economic Activity

The analysis is quarterly data for 19 emerging markets spanning the period 1966-2012. To investigate the relationship among our variables as well as the direction of the relationship, we used Vector Auto-regression, Granger Causality, and Variance Decomposition analysis. The estimation of a Vector Auto-regression, VAR model, introduces by Sims (1980), requires two steps. First, a vector of variables dated at time  $t$  is regressed on several lags of itself. The residuals from these regressions are interpreted as innovations which show the new information about the variables that became available during period  $t$ . In the second step of estimation, these innovations are regressed on

themselves, using one of several statistical procedures. The second-stage regressions are often given a structural or behavioral interpretation. Therefore, the residuals from the second-stage regressions are often viewed as structural shocks.

$$Y_t = AY_{t-1} + \dots + A'Y_{t-k} + e_t \quad (3)$$

where  $k$  is the number of lags that is considered in the system  $Y_t$ ,  $Y_{t-1}, \dots, Y_{t-k}$  equals to the  $1 \times p$  vector of variables and  $A, \dots, A'$  equal to the  $p \times p$  matrices of coefficients to be estimated. Also  $e_t$  is an  $1 \times p$  vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables.

#### 4.2.1. Unit Root Test

For the co-integration methodology, at least two of the series should be non-stationary process that contains a single unit root. If  $Y_t \sim I(1)$ , then  $Z_t = Y_t - Y_{t-1}$  is stationary  $I(0)$ . We used Augmented Dickey-Fuller test on all of the variables for each country separately. We took first differences of all the variables that are non-stationary to make them stationary. We also used Akaike and Schwarz criterions to determine the lag lengths for each country. Estimating the six dimensional VAR at the individual country level can suffer from too few degrees of freedom especially if there is missing data which is very common for macro variables. We had to drop some of the variables in some countries to get around this problem, especially the variables that have significant missing quarterly data.

#### 4.2.2. Granger Causality Test

In a regression analysis, we look at the dependence of one variable on other variables, but it does not necessarily show the causation. In other words, the existence of a relationship between variables does not prove causality or the direction of the influence.

Granger (1969) developed a test approach to prove that a time series  $X$  contribute to the prediction of another series,  $Y$ . In this section the relationship among house price index returns, GDP, inflation, money

market rate, private credit and money supply are investigated using Granger Causality tests.

Table 5 displays the results from the Granger causality tests for each country, which reveals strong evidence of multi-directional causality between house prices, GDP, CPI, interest rates, money, and credit. In Hong Kong, Lithuania, Mexico and Poland, for example, the relationship between house prices and GDP is in both directions; GDP has a significant effect on the future house prices and house prices also have significant effect on the future GDP. This multi-directional relationship also exists between CPI and house prices in Hong Kong and Lithuania. There is also a multidirectional link between MMR and house prices in Czech Republic, South Africa and South Korea. Finally in Czech Republic the direction of relationship between private credit and house prices is bi-directional.

The below table (Table 5) shows the direction of granger causality tests conducted in each country.  $\Delta REI$  is the growth of the house price index;  $\Delta GDP$  is the growth of GDP; MMR is the level of Money Market Rate;  $\Delta CPI$  is the growth of Consumer Price Index,  $\Delta D$  is the log of private credit, and  $\Delta M3$  is the log of money supply. P values are in parenthesis.



**Table 5.** Granger Causality Test

| $\Delta GDP \rightarrow \Delta REI$ | $\Delta REI \rightarrow \Delta GDP$ | $\Delta GDP \leftrightarrow \Delta REI$ |
|-------------------------------------|-------------------------------------|-----------------------------------------|
| Hong Kong (0.09)                    | Bulgaria(0.01)                      | Hong Kong                               |
| Lithuania (0.01)                    | Estonia (0.04)                      | Lithuania                               |
| Mexico (0.02)                       | Hong Kong (0.01)                    | Mexico                                  |
| Poland (0.08)                       | Lithuania (0.01)                    | Poland                                  |
|                                     | Mexico (0.07)                       |                                         |
|                                     | Poland (0.01)                       |                                         |
|                                     | Russia (0.01)                       |                                         |
|                                     | Slovak Republic (0.01)              |                                         |
|                                     | South Africa (0.01)                 |                                         |
|                                     | Turkey (0.01)                       |                                         |
| $\Delta CPI \rightarrow \Delta REI$ | $\Delta REI \rightarrow \Delta CPI$ | $\Delta CPI \leftrightarrow \Delta REI$ |
| Hong Kong (0.09)                    | Hong Kong (0.01)                    | Hong Kong                               |
| Hungary (0.04)                      | Indonesia (0.03)                    | Lithuania                               |
| Latvia (0.04)                       | Lithuania (0.01)                    |                                         |
| Lithuania (0.09)                    | Slovak Republic (0.01)              |                                         |
| Mexico (0.02)                       | South Korea (0.01)                  |                                         |
|                                     | Thailand (0.05)                     |                                         |
| $MMR \rightarrow \Delta REI$        | $\Delta REI \rightarrow MMR$        | $MMR \leftrightarrow \Delta REI$        |
| Czech Republic (0.09)               | Bulgaria (0.01)                     | Czech Republic                          |
| Estonia (0.09)                      | Czech Republic (0.09)               | South Africa                            |
| Israel (0.01)                       | Hungary (0.04)                      | South Korea                             |
| South Africa (0.02)                 | South Africa (0.01)                 |                                         |
| South Korea (0.02)                  | South Korea (0.02)                  |                                         |
|                                     | Turkey (0.04)                       |                                         |
| $\Delta M3 \rightarrow \Delta REI$  | $\Delta REI \rightarrow \Delta M3$  | $\Delta M3 \leftrightarrow \Delta REI$  |
| Hong Kong (0.01)                    | Czech Republic (0.01)               |                                         |
|                                     | Malaysia (0.01)                     |                                         |
| $\Delta D \rightarrow \Delta REI$   | $\Delta REI \rightarrow \Delta D$   | $\Delta D \leftrightarrow \Delta REI$   |
| Czech Republic (0.01)               | Bulgaria (0.01)                     | Czech Republic                          |
| Indonesia (0.07)                    | Czech Republic (0.03)               |                                         |
|                                     | Hong Kong (0.04)                    |                                         |
|                                     | Lithuania (0.02)                    |                                         |
|                                     | Russia (0.04)                       |                                         |

It is also interesting to see that in almost every country, house prices significantly affect the future broad money, private credit and macro variables. This has an important implication for the policy makers in these countries as well as the potential investors to those countries. Central banks do not necessarily implement policies to influence the future house prices, however, our results show that their policies can actually influence future house prices as well as the house prices strongly influence future broad money and private credit growth levels.

### 4.2.3. Variance Decomposition

In order to decompose the variance of each element of  $Y_t$  in equation 3 into components due to each of the elements of the error term and to do so for various horizons, we conduct variance decomposition analysis. In this analysis we are trying to see how much of the variance of each element of  $Y_t$  is due to the first error term and how much due to the second error term and so on.

Our findings show an interesting picture for 19 emerging markets. Table 6 presents that the forecast errors of house price index returns are mainly attributable to their own innovations in Bulgaria, Czech Republic, Slovak Republic, Slovenia, and South Africa in the following quarter. However, in Israel, only 33% is attributable to its own innovation whereas 38% of the forecast error variance is explained by the innovations in CPI. In Estonia, Indonesia, Israel, Poland and Thailand less than 60% of the forecast errors are explained by their own innovations. Interestingly in Poland, innovations in CPI explain more than 46% of the forecast error variance to house price index returns. When we look at the second quarter horizon in table 6, also in Hong Kong, Lithuania, Malaysia, Mexico, Russia and Turkey less than 60% of the forecast errors are explained by their own innovations. In almost every country we investigated, forecast errors to GDP, CPI, and money market rate play an important role in explaining innovations to the house price index returns.

The below table (Table 6) shows the variance decomposition of house index growth in each country. REI is the growth of the house price index; GDP is the growth of GDP; MMR is the level of Money Market Rate; CPI is the growth of Consumer Price Index, D is the log of private credit, and M3 is the log of money supply.

**Table 6.** Variance Decompositions

| Period         | S.E.     | REI      | GDP      | MMR      | CPI      | D        | M3       |
|----------------|----------|----------|----------|----------|----------|----------|----------|
| Bulgaria       |          |          |          |          |          |          |          |
| 1              | 0.024157 | 100      | 0        | 0        | 0        | 0        | 0        |
| 2              | 0.031711 | 81.0747  | 5.530402 | 6.061027 | 2.8238   | 4.50706  | 0.003009 |
| 3              | 0.050675 | 77.97421 | 2.21586  | 16.83344 | 1.196401 | 1.778603 | 0.001487 |
| Czech Republic |          |          |          |          |          |          |          |
| 1              | 0.022201 | 100      | 0        | 0        | 0        | 0        | 0        |
| 2              | 0.047523 | 93.13504 | 5.120865 | 0.066697 | 0.051782 | 1.552998 | 0.072618 |
| 3              | 0.069225 | 78.24086 | 16.86071 | 0.053422 | 0.535702 | 4.23035  | 0.078966 |
| Estonia        |          |          |          |          |          |          |          |
| 1              | 0.063735 | 58.78516 | 12.78755 | 28.14462 | 0.282668 | 0        | 0        |
| 2              | 0.072426 | 45.53605 | 13.55422 | 34.58357 | 2.245882 | 0.031937 | 4.048342 |
| 3              | 0.078737 | 39.14124 | 14.80916 | 33.80846 | 8.379692 | 0.366971 | 3.49448  |
| Hong Kong      |          |          |          |          |          |          |          |
| 1              | 0.030106 | 74.99744 | 0.032971 | 11.88576 | 13.08383 | 0        | 0        |
| 2              | 0.047896 | 55.13629 | 0.039506 | 19.81967 | 16.62758 | 4.372861 | 4.004098 |
| 3              | 0.058281 | 43.70027 | 4.087707 | 23.19794 | 13.441   | 8.984462 | 6.588625 |
| Hungary        |          |          |          |          |          |          |          |
| 1              | 0.017843 | 68.89523 | 2.423627 | 9.406063 | 19.27508 | 0        | 0        |
| 2              | 0.018313 | 68.53662 | 2.482223 | 9.586204 | 18.3672  | 0.944833 | 0.082918 |
| 3              | 0.018922 | 67.36271 | 3.044674 | 10.54692 | 17.83996 | 0.890909 | 0.31482  |
| Indonesia      |          |          |          |          |          |          |          |
| 1              | 0.006904 | 39.00586 | 2.743775 | 7.785134 | 50.46524 | 0        | 0        |
| 2              | 0.008069 | 30.1889  | 4.633825 | 5.815601 | 53.88642 | 5.466183 | 0.009081 |
| 3              | 0.009158 | 23.55779 | 5.625276 | 14.42514 | 42.0328  | 14.18964 | 0.169355 |
| Israel         |          |          |          |          |          |          |          |
| 1              | 0.014088 | 33.45416 | 9.106639 | 19.20721 | 38.23199 | 0        | 0        |
| 2              | 0.016441 | 31.44371 | 11.93171 | 23.14612 | 31.18132 | 1.155003 | 1.142133 |
| 3              | 0.018134 | 28.46376 | 14.22682 | 25.15489 | 27.11396 | 4.055117 | 0.985443 |
| Latvia         |          |          |          |          |          |          |          |
| 1              | 0.102881 | 84.92258 | 12.07714 | 0.173257 | 2.827026 | 0        | 0        |
| 2              | 0.105802 | 80.32982 | 11.71405 | 0.257026 | 7.699099 | 0        | 0        |
| 3              | 0.106228 | 79.75319 | 11.73884 | 0.404214 | 8.103748 | 0        | 0        |
| Lithuania      |          |          |          |          |          |          |          |
| 1              | 0.077673 | 71.85774 | 11.79486 | 0.394036 | 15.95337 | 0        | 0        |
| 2              | 0.085396 | 59.73515 | 14.2033  | 0.704092 | 21.855   | 3.502454 | 0        |
| 3              | 0.098347 | 51.58357 | 19.48563 | 7.959546 | 18.30758 | 2.663678 | 0        |
| Malaysia       |          |          |          |          |          |          |          |
| 1              | 0.035419 | 62.15115 | 24.48083 | 4.723128 | 8.644898 | 0        | 0        |
| 2              | 0.044953 | 47.3974  | 37.29059 | 3.076149 | 12.11371 | 0        | 0.122148 |
| 3              | 0.045099 | 47.09465 | 37.06453 | 3.121785 | 12.10755 | 0        | 0.61148  |
| Mexico         |          |          |          |          |          |          |          |
| 1              | 0.009546 | 70.06695 | 0.004049 | 28.69054 | 1.238463 | 0        | 0        |
| 2              | 0.01064  | 56.39961 | 7.084196 | 24.06984 | 10.19012 | 0        | 2.25623  |
| 3              | 0.011372 | 51.64943 | 8.238863 | 24.71749 | 13.01386 | 0        | 2.380353 |

|                 |          |          |          |          |          |          |          |
|-----------------|----------|----------|----------|----------|----------|----------|----------|
| Poland          |          |          |          |          |          |          |          |
| 1               | 0.040745 | 21.6541  | 4.496019 | 27.24993 | 46.59995 | 0        | 0        |
| 2               | 0.048746 | 24.75313 | 9.648047 | 28.18578 | 37.32417 | 0        | 0.088874 |
| 3               | 0.060885 | 28.26724 | 8.110692 | 28.71206 | 32.15057 | 0        | 2.759436 |
| Russia          |          |          |          |          |          |          |          |
| 1               | 0.037977 | 70.56521 | 18.56186 | 0.485193 | 10.38773 | 0        | 0        |
| 2               | 0.043642 | 53.50575 | 16.19698 | 0.778594 | 25.58018 | 0.951301 | 2.987207 |
| 3               | 0.047568 | 51.42839 | 14.07409 | 0.907194 | 21.53531 | 0.871043 | 11.18397 |
| Slovak Republic |          |          |          |          |          |          |          |
| 1               | 0.018012 | 100      | 0        | 0        | 0        | 0        | 0        |
| 2               | 0.025347 | 99.76028 | 0.061759 | 0        | 0.177958 | 0        | 0        |
| 3               | 0.034925 | 98.68466 | 0.204    | 0        | 1.111337 | 0        | 0        |
| Slovenia        |          |          |          |          |          |          |          |
| 1               | 0.032443 | 100      | 0        | 0        | 0        | 0        | 0        |
| 2               | 0.036588 | 96.74549 | 1.225553 | 0        | 0.116883 | 0        | 1.912072 |
| 3               | 0.037587 | 94.26179 | 3.09955  | 0        | 0.141117 | 0        | 2.497541 |
| South Africa    |          |          |          |          |          |          |          |
| 1               | 0.012137 | 99.64917 | 0.17224  | 0.101014 | 0.077571 | 0        | 0        |
| 2               | 0.017433 | 93.58635 | 0.125583 | 3.793401 | 0.13879  | 1.380478 | 0.975399 |
| 3               | 0.020111 | 86.71716 | 0.576669 | 7.915657 | 0.37984  | 2.996521 | 1.414152 |
| South Korea     |          |          |          |          |          |          |          |
| 1               | 0.013546 | 85.33999 | 10.33327 | 0.045611 | 4.281133 | 0        | 0        |
| 2               | 0.017821 | 65.14771 | 22.9192  | 7.732547 | 3.763197 | 0.126361 | 0.310983 |
| 3               | 0.022263 | 47.89443 | 24.49571 | 17.4917  | 4.504618 | 5.40568  | 0.207866 |
| Thailand        |          |          |          |          |          |          |          |
| 1               | 0.009175 | 14.88978 | 0.444163 | 19.9962  | 64.66986 | 0        | 0        |
| 2               | 0.011393 | 11.03682 | 32.17626 | 14.41466 | 42.37226 | 0        | 0        |
| 3               | 0.011833 | 11.06525 | 30.71152 | 13.85177 | 44.37147 | 0        | 0        |
| Turkey          |          |          |          |          |          |          |          |
| 1               | 0.013866 | 84.12949 | 0.001894 | 6.342265 | 9.526354 | 0        | 0        |
| 2               | 0.0273   | 54.16049 | 1.609169 | 4.251012 | 39.63942 | 0        | 0.339912 |
| 3               | 0.034881 | 41.07273 | 1.133549 | 5.608226 | 51.90887 | 0        | 0.276629 |

## 5. Concluding Comments

Housing market is undoubtedly one of the most important components of a national economy. This is also true for emerging countries. However, there is not enough empirical evidence regarding their interaction with money, private credit and macro economy. Central banks are not necessarily primarily interested in movement of asset prices, particularly house prices; however house price changes can have important implications for economic activity and inflation. The consequences of substantial changes in house prices should also be watched carefully by central banks and other government agencies that

regulate financial institutions for the purpose of financial stability. 2008 crises showed that the house prices have important effects on the overall economy. Emerging markets have been relatively less affected by this crises compared to the developed markets.

Using the fixed effects panel data approach, this paper analyzes the variation in 19 emerging markets house index returns. Our results show that money market rate, growth in GDP and CPI as well as log of private credit (D) and money supply (M3) have significant predictive power on growth in house price indices a quarter ahead. There is a strong negative correlation between the growth in house price indices and the lagged money market rates and private credit. There is a strong positive correlation between the growth in house price indices and the lagged growth in GDP, CPI and log of M3. When we look at different regions, we show that in Eastern Europe only GDP has a predictive power whereas in Asia MMR, D as well as M3 has statistically significant predictive power.

Granger causality tests for each country reveals strong evidence of multi-directional link between house prices, GDP, CPI, interest rates, money, and credit. House prices significantly affect the future broad money, private credit and macro variables. When we look at the variance decomposition, in almost every country we investigated, forecast errors to GDP, CPI and money market rate play an important role in explaining innovations to the house price index returns.

Findings of this study may have important implications over the macro and monetary policies of the emerging markets. There has been a dramatic increase in REIT funds in the last decade. Emerging markets REIT funds also have become important tool in investments. Since the underlying asset of REITs are the house prices, finding variables that have important implications in a lead-lag relationship can also have important implication on these funds. Empirical findings of this paper do not necessarily support this analysis therefore a future research on the variables we investigated and REITs can present important implications for investors on more liquid assets like REITs.

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**Appendix A.**

| <b>Monthly Data</b>             | <b>Starting Date</b> | <b>Ending Date</b> |
|---------------------------------|----------------------|--------------------|
| HONG KONG SAR                   | Jan-93               | May-12             |
| ISRAEL                          | Jan-01               | Apr-12             |
| KOREA                           | Jan-86               | Jun-12             |
| THAILAND                        | Mar-08               | May-12             |
| SOUTH AFRICA                    | Jan-66               | Jun-12             |
| TURKEY                          | Jun-07               | Jun-12             |
| <b>Quarterly Data</b>           | <b>Starting Date</b> | <b>Ending Date</b> |
| BULGARIA                        | 1997Q1               | 2012Q2             |
| CZECH REPUBLIC                  | 2004Q1               | 2010Q4             |
| ESTONIA                         | 2003Q3               | 2012Q1             |
| HUNGARY                         | 2001Q4               | 2012Q2             |
| INDONESIA                       | 2002Q1               | 2012Q2             |
| LITHUANIA                       | 1998Q4               | 2012Q1             |
| LATVIA                          | 2006Q1               | 2012Q1             |
| MEXICO                          | 2005Q1               | 2012Q1             |
| MALAYSIA                        | 2005Q1               | 2012Q1             |
| POLAND (5 MISSING OBSERVATIONS) | 2002Q4               | 2012Q1             |
| ROMANIA                         | 2009Q1               | 2012Q1             |
| RUSSIA                          | 2001Q1               | 2012Q1             |
| SLOVENIA                        | 2007Q1               | 2012Q1             |
| SLOVAK REPUBLIC                 | 2005Q1               | 2012Q1             |

## **Does Financial Deepening spur the Economic growth? Evidence from Bosnia and Herzegovina**

Mehmed Ganić<sup>1</sup>, Betül Ismić<sup>2</sup>, Sahrudin Sarajčić<sup>3</sup>

This paper focuses on the exploration of the causal link between the degree of financial deepening and economic growth in Bosnia and Herzegovina (B&H) by employing ARDL cointegration estimation methodology. ARDL model gives an indication of how some specified variables affect each other over the period of 2006:Q1-2014:Q3. Our findings did not confirm the statistically significant and positive influence of financial deepening on B&H economic growth as measured by FD2, FD3 (Financial Development Indicator-2, and Financial Development Indicator-3) or this relationship seems to be unclear. Obviously, except for the FD1 (monetization ratio) variable, which was proven to be statistically significant and positive in terms of economic growth, this relationship was questionable for the other two variables. Furthermore, it is interesting to note that the behavior of economic growth was strongly influenced by the quality of the financial sector environment and aid effectiveness over the sample period.

### **1. Introduction**

The establishment of a stable market environment for financial institutions in Bosnia and Herzegovina (B&H) has a fundamental importance in terms of the transition of this country from a centrally planned towards market-oriented economy. In recent years, this transition process has been characterized by a substantial progress in strengthening the resilience of the banking sector and opening a new dimension in terms of improvement of its potential.

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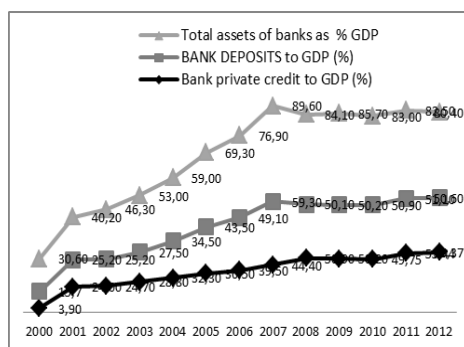
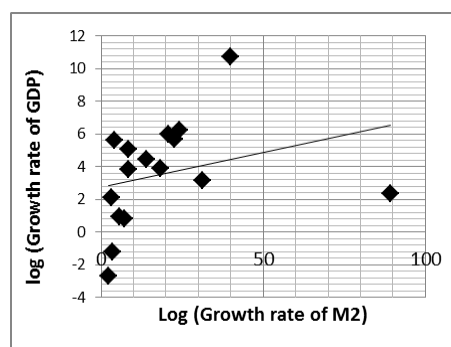
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In the era of transition, B&H has restructured its financial system and established a new framework of financial markets, in a profound and lasting manner. In its nature, the financial market of B&H is viewed as; shallow and underdeveloped, with a high concentration of the banking sector. As a small country with a small market size, with the poor level of coordination among different government and institution levels, the B&H also has some problems with the existence of well-functioning financial markets. At the same time, infant capital market and its segments, in particular, equity markets and corporate bond markets, generally, have not been developed. The strong credit expansion and credit contraction in B&H in pre-crisis times was the result of financial deepening and restructuring of the financial system.

Moreover, the process of acceleration of financial consolidation was intensified through different tendencies; such as: deregulation, privatization and entry of foreign banks. The process of privatization and sound reforms of the banking sector aimed at overcoming the debt problem. These activities accumulated in the past and resulted in the elimination of the most vulnerable segments of the banking sector. Accordingly, it should be noted that the number of banks was significantly reduced from 1997 (when first post data appeared). A transition to the new era of market oriented commercial banking was marked by the processes of mergers, acquisitions and consolidations of banks, where the number of commercial banks has declined from 76 (in 1997) to 28 banks (in 2012). The analysis of the financial depth (measured as the ratio of M2 to GDP) and financial intermediation (measured as the ratio of private credits to GDP) ratio over a given time period (shown in figure 1) implies some positive trends in the banking industry in B&H.

As shown in the Figure 1, in 2007, the share of commercial banks' activities in financial intermediation was well over 89% of GDP, thus, performing an important function in the financial system of B&H. A further feature of the development of the domestic banking sector is represented in the enhanced role of bank-based financial intermediation. Figure 1 gives an overview of some indicators, as the share of assets, loans and deposits in GDP of B&H.

**Figure 1:** Financial intermediation in B&H**Figure 2:** The relationship between M2 and GDP over the period 2000– 2013

Source: The authors' elaborations on CB of B&H data

As illustrated in Figure 1, financial intermediation, measured by banks' assets to % of GDP, has shown a marked increase from 2000 (e.g. 30.6% of GDP) to 2007 (e.g. 89.6% of GDP). Adverse effects of the global financial crisis translated into reduction of financial intermediation of banks and its slight decline to 80.4% of GDP (2012). During the initial period, the growth of the deposit funding base of banking sector (i.e. as measured as % of bank deposits to GDP) caused the growth of banks' private credits. The total deposits held by banking sector have almost tripled between 2000 and 2007. Meanwhile, by the end of 2012, the share of deposits to GDP reached 50.6 percent, while the share of banks' private credits to GDP reached 56.7 percent. It must be noted that the ratio of private credits to GDP measured at 24% in B&H has crossed the threshold of underdeveloped countries (measured at 20%), in 2001. The share of banks' loans in the total loans to the private sector was slightly above 50%, indicating insufficient development of the financial market. While banks' deposits to GDP ratio reached a historical peak of 59.3 percent (2007) banks' private credit to GDP ratio has also grown positively over time. With the initiation of economic reforms in B&H, since 1998, the growth of broad money M2 was associated with rate higher than the growth rate of GDP (figure 2). Annual growth of M2 in the period 1998 -2013 was moving at an average rate of 18.94%, reflecting the intense process of economy's financial system deepening. In broader sense, this means that an increase in the scope of services of the financial sector were aimed at private sector and household, in parallel with the growth and development of

the economy. All of these changes, compared with the average rate of movement of GDP from 3.56% were the result of the reform's measures, launched in 1997, and its transition to market-oriented economic system. Several reasons have contributed to this growth of the money supply. Firstly, it was the recovery of public confidence in a reformed banking system, which resulted in an inflow of households' savings to commercial banks. The growth rate of deposits, in national and foreign currencies, had a positive impact on the growth of money supply and monetary multiplication of money. The second reason was the influx of money from privatization and foreign direct investment.

In parallel, with the increased value of the monetary aggregate M2 to GDP, the growth of ratio private credit to GDP was recorded. The initial level of banks' credits to the private sector, expressed as a share of GDP in B&H was significantly below average than the one measured in the EU member countries. One of the reasons is the underdevelopment of the domestic financial (banking) system at the beginning of the transition process. The second reason was war and war events in this region that have devastated the domestic banking sector. Expansion of banks' lending started with the low levels of financial intermediation with the aim to "catch up" to the level of financial deepening in advanced transition countries. Therefore, it was expected that the ratio of loans to GDP must grow faster over time.

## **2. Literature Review**

In the last two decades, the question of the possible link between financial deepening and economic growth has been on the forefront of the economic debate. This phenomenon could be viewed in two different ways: Looking at scholars' views into relation financial deepening - economic growth, we can see two schools of thought existing, the first holds that the role of financial factors in economic growth is overemphasized. The second view holds that finance matters for growth. These findings are not unique to the transition countries, but some researchers generally have not found a cause-and-effect relationship between credit to the private sector and economic growth. The main point highlighted was that economic growth in transition countries was not constrained by underdeveloped financial sectors. According to Ferguson (2008) the role of financial deepening in the financing of economic growth was an essential and very necessary factor. There are

many theoretical models which examine and assess the various channels through which finance influences growth. One of the most widely applicable and most easily measurable indicators of financial depth is the ratio of commercial banks' assets to GDP. The same ratio was used by Goldsmith (1969) a prominent figure in the development of a new finance doctrines provided the earliest evidence of causality between financial sector development and economic growth (measured by GDP per capita). In this strand, McKinnon's (1973) work is worth mentioning that financial deepening increases the level of domestic savings rate and reduce borrowing costs and thus encourages investment. Moreover, an increase in interest rates encourages savings with financial intermediaries, and thus, additionally increases the investment funds and contributes to the long-term growth.

In the early 1990s, a number of economists began to analyze, in more detail, the connection between financial deepening and economic growth. The most remarkable study in this field concerned with the contribution to the emerging of understanding of financial deepening and economic growth was the study carried out by King and Levine (1993a; 1993b). They employed a sample cross-country data for 80 countries (from 1960 to 1989) using four variables (the ratio of liquid liabilities to GDP, the ratio of deposit money banks' domestic assets to deposit money banks' domestic assets plus central bank domestic assets, credit issued to private enterprises divided by credit issued to central and local governments plus credit issued to public and private enterprises and credit issued to private enterprises divided by GDP) to examine their effect on economic growth. Their findings provide evidence in favor of the view that there is significant correlation between the aforementioned indicators of financial deepening and economic growth. Furthermore, the level of financial development is a good predictor of future economic growth rates and progress in productivity. In other words, finance does not merely follow economic activity. In coming years, several similar studies were conducted by Calderon and Liu (2002), Christopoulos and Tsionas (2004), Koivu (2002) and Mehl et al. (2005).

Calderon and Liu (2003) used a large sample of 109 countries in the period between 1960 to 1994 to investigate the factors affecting economic growth. From the financial development variables the authors used ratio of broad money (M2) to GDP and the ratio of credit provided

by financial intermediaries to the private sector to GDP. In addition to these variables, for purposes of the model, other specific controlling variables were tested, such as: initial human capital, initial income level, a measure of government size, black market exchange rate premium and regional dummies for Latin America, East Asia and Africa. They clarified the findings by suggesting that financial deepening contributed significantly to economic growth, more in developing countries than industrial countries. Also, Bordo and Rousseau (2006) used M2 to GDP ratio as a proxy variable for financial development, in order to examine its impact on output growth. Explaining their findings, they highlighted that „the longer the period of the sample the larger the effect of financial development on economic growth“. Financial deepening propels economic growth by a more rapid capital accumulation and productivity growth.

At this point it is worth mentioning the study authored by Christopoulos and Tsionas (2004) entitled: „Financial development and economic growth: evidence from panel unit root and cointegration tests, which analyzes 10 developing countries covering the years 1970 to 2000“. The findings of their research did not find a statistically significant short-run causality between financial deepening and GDP.

There are several similar studies conducted in transition countries. Koivu (2002) examined relationship between efficiency and size of the banking sector and economic growth (measured by annual real GDP growth) using panel data for 25 transition countries, over the period between 1993 to 2000. The study could not find a strong relationship between the amount of banks' credit allocated to the private sector and economic growth, while the causality between the growth of credit and real GDP growth remained unclear.

On the other hand, the relationship between financial deepening and growth has recently been summarized in a study conducted by Mehl et al (2005). Their study used panel data set comprised of annual data over the period between 1993 to 2001 for eight Southeast European countries: (Albania, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia (FYR Macedonia) and Serbia and Montenegro, Bulgaria, Romania and Moldova). In an analysis of transition economies, they could not find the evidence that financial deepening positively impacted the economic growth in eight Southeast

European countries. The causality between the development of financial intermediation and economic growth was found to be negative. It was explained by the facts that if a financially environment is unstable, then financial intermediation does not encourage growth and efficiency. Also, the researchers pointed out that the quality of the banking sector may be important for economic growth, rather than financial deepening itself.

Demetriades and Hussein (1996), in reviewing possible relationship between financial development and growth discovered findings similar to those of Mehl et al (2005) by stressing country heterogeneity. By employing panel data analysis on a sample of 16 transition economies, in the period of 27 years, they explored the important determinants (ratio of bank deposit liabilities to nominal GDP and ratio of bank claims on the private sector to nominal GDP) thus affecting the economic growth. The authors clearly stated that the direction of causality between financial development and long-term growth rates among analyzed transition countries was different for each of analyzed countries. But, in a few countries, they found that economic growth caused financial development (Honduras, Spain and Sri Lanka) while findings showed reverse causation in six countries (El Salvador, Greece, Pakistan, Portugal, South Africa, and Turkey), all of which refuted the hypothesis that finance led to growth. Accordingly, it could not be concluded that finance does not cause growth, nor that finance follows growth applicable for each country from a sample. Therefore, they concluded that differences in the development of the financial sector in any country could have arisen by change of institutional characteristics, different policies, as well as differences in their application.

Using cross-country data comprising 34 countries, in the 1950s and 51 countries in the 1960s, Papanek (1973) investigated the aid-growth relationship and the influence a several explanatory variables (foreign aid, foreign investment, other flows and domestic savings as variables) on economic growth. His study revealed that foreign aid as a component of foreign inflows has a more substantially effect on growth than the other variables (savings or other forms of foreign resource inflows) confirming his expectations that aid can fill the foreign exchange gap as well as the savings gap.



Employing cross-sectional data over the period between 1971 to 1990 for seventy seven Developing Countries Fayissa and El-Kaissy (1999) examined aid's growth impact and utilization of foreign aids. They found that foreign aid positively related with the growth of GDP per capita economic growth in most of employed regression's models.

A recent study done by Karras (2006) investigates how foreign aid affects economic growth measured by GDP per capita employing annual data from the 1960 to 1997 for a sample of 71 aid-receiving developing countries. The foreign aid was measured by two variables: total net ODA receipts per capita and total net ODA receipts as a fraction of GDP. Accordingly, their empirical findings revealed that aid-growth relationship is positive, permanent, and statistically significant.

In a recent study, Christopoulos and Tsionas (2004) investigated the long run relationship between financial depth and economic growth combined in a cross-sectional and time series data. They employed panel unit root tests and panel cointegration analysis for 10 developing countries (Ecuador, Jamaica, Colombia, Paraguay, Mexico, Peru, Thailand, Dominican Republic, Honduras, and Kenya). The econometric findings provided support for the view that a long-run causality runs financial depth and output, but there was no evidence of the causal relationship, in both directions. However, the findings did not necessarily have any short-run causality between financial depth and output.

**Table 1:** Summary of the Related Literature

| <b>Authors (s) &amp;<br/>Year of Study</b> | <b>Major Findings</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| King and Levine, 1993.b)                   | Authors found that financial systems stimulate faster productivity growth and growth in per capita output. A large cross-country sample (80 countries) had high values of DEPTH (measured by Ratio of liquid liabilities to GDP), in 1960 grew faster, had higher rates of physical capital accumulation, higher investment rates, and more rapid rates of technological advancement over the 1960-1989 period. Accordingly, the development of the financial system can be positively correlated with future growth due to the fact that the financial system develops in anticipation of future economic growth. Furthermore, it has shown that differences in political systems, legal traditions or institutions can also affect the financial development and economic growth. |
| Huang and Lin (2009)                       | Huang and Lin (2009) examined data from study performed by Levine, Loayza and Beck (2000) and employed threshold model with instrumental variables, confirming the positive relationship between financial development and economic growth. According to their findings, this relationship between financial development and economic growth was more pronounced in low-income countries. Also, their study found that in low-income countries financial development does robustly affect capital accumulation and productivity growth.                                                                                                                                                                                                                                             |
| De Gregorio and Guidotti (1995)            | The study found positive correlation between financial indicator (measured by credit to private sector) and growth in more cases but effect of financial deepening is smaller in Latin American countries than in the rest. Moreover, there is additional evidence which points to a long-run negative correlation in a panel data in the case of Latin America. Although, it changes across countries this trends can be explained by effects of extreme liberalization of financial markets followed by their collapse and heterogeneity across countries.                                                                                                                                                                                                                        |
| Demetriades and Hussein (1996)             | Their study found evidence that finance is a leading sector in the process of economic development employing a sample of 16 countries in the period of 27 years. Also, result of their research showed that the direction of causality between financial development and long-term growth is different for different countries. Furthermore, their study found evidence for some countries that economic growth is the predecessor of financial development.                                                                                                                                                                                                                                                                                                                        |

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Odedokun (1996)                      | A study by Odedokun, covering the period 1960s to 1980s, in the sample of 71 countries found that financial intermediation promotes economic growth in about 85% of countries.                                                                                                                                                                                                                                                                                                                                                                                              |
| Levine (1998)                        | He has found statistically significant evidence between development of banking sector and long-term economic growth rates. Furthermore, differences in the legal rights of creditors and the efficiency of the judiciary system explained more than half of the variation in development of the banking sector.                                                                                                                                                                                                                                                             |
| Deida and Fattouh (2002)             | Authors employed threshold regression using the data from the study by King and Levine (1993a, 1993.b) and concluded that in low-income countries there was a significant relationship between finance and economic growth, while in high-income countries it was statistically significant and positive.                                                                                                                                                                                                                                                                   |
| Calderon and Liu (2002)              | The findings of their studies (using a sample of 109 developing and industrial countries from 1960 to 1994) revealed that financial development generally led to economic growth. Financial deepening contributes to causality between financial development and economic growth in the developing countries more than in industrialized countries. Also, in a broader sense they concluded that financial deepening propelled economic growth more rapidly through two channels: capital accumulation and productivity growth, with the latter one is being much stronger. |
| Christopoulos and Tsionas (2004)     | The results obtained in their study found that long-run causality ran from financial development to economic growth, but there was no evidence of bi-directional causality. However, in the short term there was no causality between financial deepening and output.                                                                                                                                                                                                                                                                                                       |
| Rogić and Bogdan (2012)              | The authors examined the hypothesis that the development of the financial system in the Republic of Croatia has a positive effect on economic growth. Their study found and confirmed that the three financial indicators ((ratios of private sector credit to total loans, total loans to GDP ratio and the interest rate differential on loans (in national currency) with a currency clause and foreign currency loans)) had a positive impact on economic growth in Croatia.                                                                                            |
| Cojocar, Hoffman, and Miller, (2011) | These researchers provided evidence that in transition countries the increases in credit to the private sector had a positive effect on the economic growth, but that it can significantly alleviate the inflation rate, high differences between interest rates on loans and deposits and decrease in competitiveness among banks.                                                                                                                                                                                                                                         |

*Source: Compiled by the authors.*

### 3. Research Methodology and Data

Of many econometric studies detailed here (section 2) it can be concluded that much less attention has been given to the Western Balkans countries and B&H. Therefore, this paper contributes to the existing literature on financial depth and economic growth, in a way that focuses on the B&H, which in many segments is still lagging behind other neighboring transition countries. Accordingly, the originality of this paper stems from the econometric analysis of the determinants of financial depth and their impact on economic growth in B&H. An econometric analysis is applied to investigate whether there is any statistically significant relationship between independent variables and the economic growth. In order to explore relationship between growth and financial depth we used model based on the endogenous growth model ( $Y = AK_t$ ).

It was extended and followed over the years in numerous studies conducted by King and Levine (1993b), Jalil and Feridun (2011), Khan (2008) and Adu, et.al. (2013). For our needs, the following model will be employed with the explanatory variables that have been proposed in the literature:

$$Y_t = \beta_0 + \beta_1 K_t + \beta_2 FD_t + \beta_3 QFE_t + \beta_4 OPEN_t + \beta_5 DEP_t + \beta_6 AID_t + u_t$$

GROWTH  $\square \square f(K, FD, \text{quality of the financial sector environment, Openness, DEP})$

Our model employs four sets of independent variables: K as a vector of control variable of growth (Gross Capital Formation as % of GDP used as a proxy variable for capital stock), typical variable for measuring financial deepening (Financial Development Indicator-1, Financial Development Indicator-2, and Financial Development Indicator-3) and a variable for measuring foreign aid (AID) are employed to quantify the impact of financial deepening on economic growth, a variable based on deposit interest rate is used to measure financial sector's efficiency, and three variables to measure quality of the financial sector environment (Government Effectiveness, Political Stability, Inflation). The dependent variable in this study includes GDP per capita growth rate, as a proxy for economic growth. Although the rate of economic growth since the end of war in 1995 and the post-war period has been predominantly aid-

driven in the last years the inflow of such a large foreign aid have been declining. The financial assistance was aimed at providing the initial funds for the reconstruction and job creation. In order to test whether the rates of economic growth and fostering development are further supported by foreign aid and transfers supported economy (aid-driven economy), our model is extended by including a variable AID since the B&H has been receiving a large amount of foreign aid. The aim of this study is to explore the impact of financial development on economic growth by employing ARDL co-integration estimation methodology. Quarterly time series data was used for this study covering the period of 2006:Q1-2014:Q3. Data were sourced from the database of Central Bank of B&H, Agency for Statistics of B&H, The World Bank - World Development Indicators (WDI), European Commission Database and The Worldwide Governance Indicators (WGI). The selection of the time period was constrained by the availability of officially published data. The existence of seasonality was tested and time series were seasonally adjusted using moving average method. In time series analysis, if a series does not have a stochastic trend and is stationary, it is said to be integrated of order zero or  $I(0)$ . If a series has random walk trend, it is said to be integrated of order one or  $I(1)$  (Stock & Watson, 2007). The null hypothesis for the non-stationarity is tested. Autoregressive distributed lag model (ARDL) of Pesaran, Shin and Smith (2001) examined the co-integration relationship among variables regardless of the order of integration ((whether they were  $I(0)$  or  $I(1)$ ). ARDL approach allowed for, both, stationary and non-stationary regressors in the model. The equation for ARDL model, is shown, below:

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 K_{t-1} + \beta_3 FD_{t-1} + \beta_4 QFE_{t-1} + \beta_5 OPEN_{t-1} + \beta_6 DEP_{t-1} + \beta_7 AID_{t-1} + \sum_{i=1}^m \Psi \Delta Y_{t-i} + \sum_{i=1}^m \theta \Delta K_{t-i} + \sum_{i=1}^m \varphi \Delta FD_{t-i} + \sum_{i=1}^m \eta \Delta QFE_{t-i} + \sum_{i=1}^m \tau \Delta OPEN_{t-i} + \sum_{i=1}^m \xi \Delta DEP_{t-i} + \sum_{i=1}^m \omega \Delta AID_{t-i} + \epsilon_t$$

Before we apply ARDL model, appropriate number of lags should be determined for the model. Lag lengths can be selected according to Akaike, Schwarz or Hannan-Quinn (AIC, SC, HQ) information criteria. While selecting appropriate lag, the model should not possess any serial correlation.

#### 4. Analysis and Discussion of Results

Before we conduct co-integration analysis, our selected variable should be tested and examined for the stationarity. The results of the Augmented Dickey Fuller and Philips Perron tests for unit root are provided on table 2. The findings reveal that variables FD1, FD2, K, FD3, DEP, PS and GE can be considered as stationary after first differences. Thus, these variables are I(1). GDP, AID, OPEN and INFR variables are observed as stationary, at a level, which means they are I(0).

**Table 2:** Unit root results

| LEVEL           | ADF        | PP          |
|-----------------|------------|-------------|
|                 | k=0        | k=3         |
| GDP             | -9.5826*** | -1..3503*** |
|                 | k=0        | k=1         |
| FD1             | -2.8282    | -2.8224     |
|                 | k=0        | k=3         |
| FD2             | -2.6061    | -2.4503     |
|                 | k=8        | k=1         |
| FD3             | 1.3238     | -2.0100     |
|                 | k=0        | k=9         |
| K               | -2.3053    | -2.6087     |
|                 | k=4        | k=0         |
| DEP             | -2.2413    | -2.0175     |
|                 | k=4        | k=2         |
| OPEN            | -3.3873**  | -2.7973*    |
|                 | k=1        | k=5         |
| INFR            | -5.7009*** | -4.3407***  |
|                 | k=0        | k=0         |
| PS              | -0.3338    | -0.3339     |
|                 | k=0        | k=0         |
| GE              | -2.3548    | -2.3548     |
|                 | k= 7       | k= 1        |
| AID             | -9.5175*** | -2.6261*    |
| 1ST DIFFERENCES | ADF        | PP          |
|                 | k=0        | k=0         |
| FD1             | -6.8692*** | -6.8692***  |
|                 | k=0        | k=0         |
| FD2             | -5.2922*** | -5.2923***  |
|                 | k=7        | k=1         |
| FD3             | -4.4785*** | -4.6244***  |
|                 | k=1        | k=3         |
| K               | -4.8366*** | -6.9191***  |
|                 | k=0        | k=3         |
| DEP             | -5.5301*** | -6.6174***  |
|                 | k=0        | k=0         |
| PS              | -5.6568*** | -5.6568***  |
|                 | k=0        | k=0         |
| GE              | -5.5962*** | -5.5851***  |

**Notes:** \*, \*\*, \*\*\* stars refer respectively to 10 %, 5 % and 1 % significance.

**Source:** Authors' calculations, E-views 8

In order to find the best model for our estimation, a model selection criteria, such as: Akaike's information criterion, the Schwarz information criterion and LM Autocorrelation test were employed (table 3). Accordingly, the best-fitting model without serial correlation and minimum information criteria was selected. For LM test, null hypothesis stated that there was no serial correlation in the model. We also provided probability values of LM test, in parenthesis, for easy interpretation. If p value is lower than 0.05, we reject null hypothesis, so there is a serial correlation in the model.

**Table 3:** Lag length selection for ARDL model

|           | <b>(1)</b> |             |                 |           | <b>(2)</b> |            |                 |           | <b>(3)</b> |            |                 |
|-----------|------------|-------------|-----------------|-----------|------------|------------|-----------------|-----------|------------|------------|-----------------|
| <b>k*</b> | <b>AIC</b> | <b>SC</b>   | <b>LM</b>       | <b>k*</b> | <b>AIC</b> | <b>SC</b>  | <b>LM</b>       | <b>k*</b> | <b>AIC</b> | <b>SC</b>  | <b>LM</b>       |
| <b>1</b>  | 4.42       | 4.92        | 4.27<br>(0.11)  | <b>1</b>  | 4.39       | 4.89       | 4.93<br>(0.08)  | <b>1</b>  | 4.30       | 4.80       | 6.55<br>(0.03)  |
| <b>2</b>  | 4.18       | 4.91        | 2.81<br>(0.24)  | <b>2</b>  | 4.14       | 4.87       | 2.34<br>(0.31)  | <b>2</b>  | 3.96       | 4.70       | 0.62<br>(0.73)  |
| <b>3</b>  | 3.79       | 4.76        | 12.83<br>(0.00) | <b>3</b>  | 4.14       | 5.11       | 0.68<br>(0.70)  | <b>3</b>  | 3.91       | 4.88       | 6.39<br>(0.04)  |
| <b>4</b>  | 3.39       | 4.61        | 29.54<br>(0.00) | <b>4</b>  | 3.67       | 4.88       | 26.06<br>(0.00) | <b>4</b>  | 3.09       | 4.30       | 15.95<br>(0.00) |
|           |            | <b>(4)</b>  |                 |           |            | <b>(5)</b> |                 |           |            | <b>(6)</b> |                 |
| <b>1</b>  | 4.28       | 4.77        | 8.56<br>(0.01)  | <b>1</b>  | 4.46       | 4.96       | 3.34<br>(0.18)  | <b>1</b>  | 4.49       | 4.99       | 5.08<br>(0.07)  |
| <b>2</b>  | 3.68       | 4.42        | 1.03<br>(0.59)  | <b>2</b>  | 4.29       | 5.02       | 0.39<br>(0.81)  | <b>2</b>  | 4.28       | 5.01       | 0.31<br>(0.85)  |
| <b>3</b>  | 3.44       | 4.41        | 15.37<br>(0.00) | <b>3</b>  | 4.14       | 5.11       | 15.30<br>(0.00) | <b>3</b>  | 4.38       | 5.35       | 9.04<br>(0.01)  |
| <b>4</b>  | 2.34       | 3.55        | 10.04<br>(0.00) | <b>4</b>  | 2.84       | 4.05       | 20.32<br>(0.00) | <b>4</b>  | 3.34       | 4.55       | 21.90<br>(0.00) |
|           |            | <b>(7)</b>  |                 |           |            | <b>(8)</b> |                 |           |            | <b>(9)</b> |                 |
| <b>1</b>  | 4.44       | 4.94        | 3.21<br>(0.21)  | <b>1</b>  | 4.46       | 4.96       | 1.52<br>(0.46)  | <b>1</b>  | 4.49       | 4.99       | 6.85<br>(0.03)  |
| <b>2</b>  | 4.31       | 5.05        | 0.92<br>(0.63)  | <b>2</b>  | 4.35       | 5.08       | 2.13<br>(0.34)  | <b>2</b>  | 4.38       | 5.11       | 0.51<br>(0.77)  |
| <b>3</b>  | 4.44       | 5.41        | 10.34<br>(0.01) | <b>3</b>  | 4.24       | 5.21       | 8.86<br>(0.01)  | <b>3</b>  | 4.45       | 5.42       | 15.57<br>(0.00) |
| <b>4</b>  | 3.19       | 4.40        | 13.46<br>(0.00) | <b>4</b>  | 3.74       | 4.96       | 28.99<br>(0.00) | <b>4</b>  | 3.66       | 4.88       | 10.19<br>(0.00) |
|           |            | <b>(10)</b> |                 |           |            |            |                 |           |            |            |                 |
| <b>1</b>  | 6.28       | 6.78        | 1.98<br>(0.15)  |           |            |            |                 |           |            |            |                 |
| <b>2</b>  | 6.05       | 6.78        | 8.82<br>(0.01)  |           |            |            |                 |           |            |            |                 |
| <b>3</b>  | 4.45       | 5.42        | 4.91<br>(0.17)  |           |            |            |                 |           |            |            |                 |
| <b>4</b>  | 4.21       | 5.43        | 29.16<br>(0.00) |           |            |            |                 |           |            |            |                 |

**Notes:** "k" represents number of lags in the model. P values are given in parenthesis for LM test.

**Source:** Author's Calculation, E-views 8.

In the light of this information, listed above, lag 2 is selected as our best-fitting model for estimation of first 9 models and lag 3 is the most appropriate for model 10. Optimal lag length for the models was already selected in previous step. Furthermore, the main findings of co-integration test based on ARDL approach are presented in Table 4. F tests are calculated with Wald Test to find a long run relationship among independent variables, while GDP growth represented a dependent variable. Null hypothesis for F test stated no existence of a long run relationship, while an alternative hypothesis stated the existence of co-integration relationship. For two sets of critical values (5% and 10%) from Pesaran (2001), table 3 provides us with lower critical bounds I(0) and upper critical bounds I(1).

If the calculated F statistics is higher than upper critical value, the null hypothesis is rejected. Our evidence showed that there was a co-integration relation between variables. It was shown in table 4 that all nine models have co-integration relation, since F-statistic is greater than the upper critical bounds. The obtained results from table 5 show the estimated Long run equilibrium effects of variables on economic growth. All offered models have good fit and they are well specified. The regressors expressed by R<sup>2</sup> explain between 0.794 and 0.972 variations in economic growth. More specifically, the explanatory power of models, which is measured by the adjusted R<sup>2</sup>, indicates that the regressors in Model 10 explain 95.4 % of variance in the original data and outperform other considered models.

**Table 4:** Wald test results for co-integration

|                     |         | <b>Critical Values*</b> |      |            |      |
|---------------------|---------|-------------------------|------|------------|------|
|                     |         | 95 % Bound              |      | 90 % Bound |      |
| Models              | F-Stat. | I(0)                    | I(1) | I(0)       | I(1) |
| FY(FD1,FD2, DEP,PS) | 6.34    | 2.86                    | 4.01 | 2.45       | 3.52 |
| FY(FD1,FD2, DEP,GE) | 6.85    | 2.86                    | 4.01 | 2.45       | 3.52 |
| FY(FD1,FD2,OPEN,GE) | 7.65    | 2.86                    | 4.01 | 2.45       | 3.52 |
| FY(FD1,FD2,OPEN,PS) | 11.19   | 2.86                    | 4.01 | 2.45       | 3.52 |
| FY(FD1,FD2, K,PS)   | 5.41    | 2.86                    | 4.01 | 2.45       | 3.52 |
| FY(FD1,K,GE,PS)     | 6.56    | 2.86                    | 4.01 | 2.45       | 3.52 |
| FY(FD1,FD2,K,GE)    | 5.35    | 2.86                    | 4.01 | 2.45       | 3.52 |
| FY(FD1,FD2,INFR,PS) | 4.77    | 2.86                    | 4.01 | 2.45       | 3.52 |
| FY(FD1,FD3,GE,PS)   | 5.60    | 2.86                    | 4.01 | 2.45       | 3.52 |
| FY (FD1,FD2,AID,PS) | 5.13    | 2.86                    | 4.01 | 2.45       | 3.52 |

\*Critical values are taken from Pesaran, Shin, Smith (2001).



Overall, several variables (K, INFLR and FD3) included in this study have shown to be statistically insignificant and insufficient for determination of the economic growth and, thus, they were not satisfactory. Table 5 also shows that, only in model 1 and model 2, the measure of financial sector efficiency by deposit rate (DEP) exerts statistically significant and positive effect on the economic growth at 10 and 5 percent level, respectfully. Furthermore, although in most studies (Sachs and Warner, 1995; Freund and Bolaky, 2008) the trade openness variable had a positive effect on economic growth, in our case, particularly in Model 3 and Model 4, this variable had a negative effect on the economic growth and it was statistically significant at the 1 percent level. This finding can be explained by the fact that B&H is import-oriented economy with a high trade deficit. In most of estimated models, the coefficient of private sector credit to GDP is found to be statistically significant and negatively related to economic growth. It is clear that the ratio of private sector credit to GDP and economic growth are in an inverse relationship. Our finding is similar with the findings of Koivu (2002), Shen and Lee (2006) and Zhang (2003). In short, it has been found that an increase in private sector credit by one unit leads to decrease in units of economic growth. Conversely, our findings show a strong evidence and statistically significant relationship at the 1 and 5 percent levels, in all models, between the ratio of M2 to GDP and economic growth. This finding agrees with the findings by Calderon and Liu (2002). Capital stock (K) variable was a positively related to economic growth (Model 6) and negatively related in Model 5 and Model 7. However, our findings revealed that this variable was statistically insignificant for determining economic growth, in the long run. Contrary to recent studies, a variable FD3, as one of the proxy measures for financial deepening, does not seem to accelerate economic growth. Likewise, in one out of nine regressions, this variable was positively related to economic growth but it was statistically insignificant.

**Table 5:** Long run equilibrium effects of variables

| Variable            | (1)                   | (2)                    | (3)                   | (4)                   | (5)                   | (6)                    | (7)                   | (8)                   | (9)                   | (10)                  |
|---------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Constant            | -34.863**<br>(-2.472) | -40.962***<br>(-3.245) | -14.392<br>(-1.719)   | -6.213<br>(-1.042)    | 10.543<br>(0.555)     | -30.465<br>(-2.561)    | -13.911<br>(-1.104)   | -9.808<br>(-1.131)    | -26.107<br>(-1.729)   | -6.087<br>(-0.653)    |
| FD1                 | 0.541***<br>(3.628)   | 0.540***<br>(3.922)    | 0.641***<br>(4.927)   | 0.763***<br>(5.327)   | 0.328***<br>(3.381)   | 0.321**<br>(2.378)     | 0.374***<br>(3.113)   | 0.414***<br>(3.167)   | 0.405***<br>(3.856)   | 0.727***<br>(5.938)   |
| FD2                 | -0.498***<br>(-3.181) | -0.291*<br>(-1.896)    | -0.575***<br>(-4.238) | -1.016***<br>(-5.249) | -0.625***<br>(-3.374) |                        | -0.419***<br>(-2.866) | -0.664***<br>(-3.305) |                       | -1.255***<br>(-5.651) |
| FD3                 |                       |                        |                       |                       |                       |                        |                       |                       | 0.034<br>(0.756)      |                       |
| K                   |                       |                        |                       |                       | -0.092<br>(-1.112)    | 0.126<br>(1.191)       | -0.092<br>(-0.656)    |                       |                       |                       |
| DEP                 | 2.419*<br>(1.978)     | 2.061**<br>(2.259)     |                       |                       |                       |                        |                       |                       |                       |                       |
| OPEN                |                       |                        | -0.169***<br>(-2.978) | -0.181***<br>(-4.013) |                       |                        |                       |                       |                       |                       |
| INFR                |                       |                        |                       |                       |                       |                        |                       | 0.282<br>(0.581)      |                       |                       |
| AID                 |                       |                        |                       |                       |                       |                        |                       |                       |                       | -3.731***<br>(-3.885) |
| GE                  |                       | -13.735***<br>(-3.437) | -8.059**<br>(-2.271)  |                       |                       | -20.559***<br>(-2.799) | -5.722*<br>(-1.884)   |                       | -30.532**<br>(-2.381) |                       |
| PS                  | -9.571**<br>(-2.496)  |                        |                       | -7.335***<br>(-3.721) | -3.003*<br>(-1.736)   | 11.065***<br>(2.134)   |                       | -3.681*<br>(-1.777)   | 18.046**<br>(-2.254)  | -8.123***<br>(-4.260) |
| R <sup>2</sup>      | 0.812                 | 0.853                  | 0.869                 | 0.918                 | 0.851                 | 0.817                  | 0.794                 | 0.8160                | 0.844                 | 0.972                 |
| Adj. R <sup>2</sup> | 0.736                 | 0.783                  | 0.807                 | 0.859                 | 0.767                 | 0.743                  | 0.723                 | 0.729                 | 0.699                 | 0.954                 |

**Notes:** Values in parenthesis are t statistics. \*, \*\*, \*\*\* stars refer to 10 %, 5 % and 1 % significance, respectively.

**Source:** Authors' own calculations.

Furthermore, the quality of the financial sector environment, as measured by GE and PS, showed that both coefficients were statistically significant, but negatively related with economic growth, in most of models. Obviously, these findings can be explained by the fact that B&H has poor quality of regulatory measures that inversely and adversely affected to economic growth. Also, it can be interpreted that B&H banking environment, being plagued by the low efficiency, unfavorable institutional environment and expansion of financial intermediation does not encourage growth and efficiency (see more, Mehl et al, 2005). Likewise, this outcome was in line with theoretical models proposed by Rodrik (2000) which examined the role of institutions in the process of economic growth, as well as the study conducted by Mehl et al (2005), King and Levine, (1993.a); King Levine, (1993.b) and Bordo and Rousseau (2006).

The first four modeled equations for models from (1) to (4) were estimated and analyzed by using FD1, FD2, DEP, openness, PS and GE. As shown by the obtained findings in Model 1, two explanatory variables FD2 and PS have a negative relationship with economic growth. The regression findings in Model 2 revealed that 85.33% of the variation of the economic growth was described by the explanatory variables. Accordingly, 1 percent increase in FD1, *ceteris paribus*, will increase Output Growth by 0.54%, 1 percent increase in FD2 will decrease economic growth by 0.29%, 1 percent increase in DEP *ceteris paribus*, will have a positive effect on economic growth by 2.06% and 1 point increase in GE index will translate into a negative effect economic growth by 13.73%.

The expected value of the economic growth in Model 3 reveals that when FD1 ratio increases by 1%, then the economic growth will increase by 0.64%; an increase of the FD2 ratio by 1% the economic growth will decrease by 0.57%; when OPEN ratio increases by 1%, then the economic growth will decrease by 0.18% and when the PS index increases by 1 point then the economic growth will decrease by 7.35%.

In model 10, the findings regarding FD1, FD2 and PS are coherent with other models. 1 percent increase in FD1 will increase economic growth by 0.72 %. Also, 1 percent increase in FD2 will decrease economic growth by 1.25 %. The sign of PS is a negative as expected. Some of the recent literature implies that on macro level, the impact of foreign aid on

economic growth is generally mixed. In some studies, the aid–growth relationship is a positive (Radelet, Clemens, and Bhavnani, 2005, Burnside and Dollar, 2000), but in some other studies a connection between aid and economic growth is a negative or even statistically insignificant (Ekanayake and Chatrنا, 2010). Interpretations vary on country basis. In the case of Bosnia and Herzegovina, a variable aid has a disappointing effect as we observe from the coefficient, 1 percent increase in foreign aid will decrease economic growth by 3.73 %.

## 5. Conclusion

As argued in the literature review, the issue of causality between country's level of financial development and economic growth in transition countries has shown mixed results. Therefore, this paper researches and tests hypothesis whether economic growth in B&H has been strongly supported by financial deepening.

Our findings did not confirm the statistically significant and positive influence of financial deepening on economic growth of B&H, as measured by FD1, FD2, FD3 or this relationship is seemed to be unclear and questionable. The evidence shows that, in terms of economic growth, the variable FD1 (monetization ratio) is proven to be statistically significant and positive. It is important to note that our findings were proven to be in line with other studies conducted by Bordo and Rousseau (2006) and Calderon and Liu (2003).

The finding implies that only one of three indicators has a positive effect on economic growth (FD1 monetization ratio) while this relationship between the variables FD2 (the financial intermediation ratio) and economic growth is found to be statistically significant, but negative. Our empirical findings were not proven to be in line with the research performed by De Gregorio and Guidotti (1995), Levine (1998) and Rogić and Bogdan (2012).

Although this econometric analysis is constrained by sample size determination, method of specification variables (certain number of variables are omitted because of low values of the F-test), our findings of negative financial intermediation ratio to economic growth were strong in all models. Also, they indicated that the output declines, have been recorded in the period of the last four years, and a high level of non-performing loans, as well as a lack of domestic financing from

nonbank sources constrained the output growth. This conclusion can be in line with the previous study conducted by Loayza and Rancière (2005).

By the same token, we could not find any relation between the FD3 and economic growth variables in all offered regression models. The last one is in contrast with a study conducted by Kar and Pentecost (2000) in Turkey. Consequently, the level of financial development has ambiguous effects on economic growth.

Furthermore, it is interesting to note that the behavior of economic growth was strongly influenced by the quality of the financial sector's environment. Our two variables, GE and PS have proven to be statistically significant, but with a negative sign. This is understandable considering that in the Index of Economic Freedom for 2015 (rule of law, government/regulatory efficiency and open markets indexes), B&H is ranked as 97th country in the world, under the category of "mostly unfree" with poor institutional and legal environment. Despite the efforts undertaken in the post-war period to develop economic prospects through institutional improvements, B&H's economy still remains in the "mostly unfree" category, and this shows that deeper institutional reforms are needed to be implemented. Consequently, quality of the financial sector environment as measured by PS and GE proved to be a robust determinant of long-term economic development, rather than financial development. Accordingly, it can be concluded that without well-developed financial institutions any positive effects of financial development on economic growth is significantly weaker or in many cases non-existent. This opinion is consistent with the previous study conducted by Demetriades and Law (2006), as well as Mehl et al (2005). Their conclusion is that institutional quality improvements most likely have a much larger direct effects on economic growth than financial development itself. In model 10, we found a negative relationship between aid and growth. Accordingly, it can be concluded that foreign aid does not enhance the economic growth in Bosnia and Herzegovina. The direction of foreign aid's effect on economic growth can be influenced by the degree of country's sound policies and institutions (Burnside and Dollar, 2000). But in the case of Bosnia and Herzegovina it is obvious that the systemic, structural and political weaknesses of Bosnia and Herzegovina (corruption, inefficiency of institutions, lack of accountability, etc.) causes the non-transparent activities of

government institutions and poorly managed of donor funds and foreign aid. Consequently, it has shown that foreign aid has a negative and statistically significant impact on the economic growth.

Overall, our findings do not imply that financial development is important for economic growth in B&H. However, a better balanced approach to studying the relationship between finance and growth is required. Also, our findings reveals and identifies some changes are needed to be improved or enhanced a sound government policies and institutions as well as institutional quality improvements.

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## Appendix 1

### Variable Definitions

| Variable                          | Notation                                                        | Measurement                                                                                                                             | Expected Sign |
|-----------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Financial Development Indicator-1 | FD1                                                             | M2 to GDP Ratio                                                                                                                         | +             |
| Financial Development Indicator-2 | FD2                                                             | Ratio of Private Sector Credit to GDP                                                                                                   | +/-           |
| Financial Development Indicator-3 | FD3                                                             | Ratio of Total Bank Deposits to GDP                                                                                                     | +             |
| Capital stock                     | K                                                               | Gross Capital Formation as % of GDP                                                                                                     | +/-           |
| Deposit Rate                      | DEP                                                             | The rate paid by commercial banks for savings deposits                                                                                  | +             |
| Trade Openness                    | OPEN                                                            | The ratio of the sum of exports and imports to GDP Ratio                                                                                | +/-           |
| Foreign aid                       | AID                                                             | Ratio of Foreign aid (measured by Net official development assistance and official aid received) to GDP                                 | +/-           |
| Inflation Rate                    | INFR- proxy for the quality of the financial sector environment | Inflation, average consumer prices(% change)                                                                                            | +             |
| Government Effectiveness          | GE- proxy for the quality of the financial sector environment   | Index, Estimate of Governance Performance (perceptions of the quality of public services, civil services, degree of political pressure) | +             |
| Political Stability               | PS- proxy for the quality of the financial sector environment   | Index, Estimate of Governance Performance(perceptions of likelihood government will be destabilized)                                    | +             |
| Output Growth                     | GDP                                                             | GDP per capita Growth Rate                                                                                                              |               |