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Future directions in International Financial Integration Research - A crowdsourced perspective

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Abstract

We crowdsource perspectives on international financial integration

Keywords: Science, Publication, Complicated

Contents

1. The Present State of International Financial Integration

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1.1. The effect of the Global Financial Crisis on International Financial Integration

The onset of the Global Financial Crisis and the subsequent response by monetary authorities, in particular in developed countries, has brought about several major changes to debt markets. First, there has been a significant drop in cross-border bank lending, in particular in the interbank lending (see for example James, McLoughlin, and Rankin, 2014; Batten, Loncarski, and Szilagyi, 2013) from around USD 12 trillion at the peak in mid 2008 to around USD 7 trillion 5 years into the GFC. On the other hand, cross-border bank lending to non-financial corporations has been rather stable. Second, the majority of the decline has been related to the lending between developed economies, in particular within Europe. Contrary to that, cross-border lending to emerging economies has increased by almost 50 percent in the same period. Third, similar developments can be observed in terms of portfolio flows, where annual debt flows are at around half of what they used to be prior to the GFC. Again, there is a stark contrast between developed and emerging markets, where post GFC there has been a major increase in portfolio flows, both equity and debt, to emerging economies. These developments indicate an important and non-transitory post GFC shift in the financial integration "channel" from an institutional to a more market-based one, as well as a looser integration among the largest developed economies and an increasing integration between developed and emerging markets. Finally, an important post GFC development relates to the composition and the ownership of debt assets. Flight to quality and massive interventions of monetary authorities raised the importance of government issued securities, in particular in more

advanced economies. As shown by Lane and Milesi-Ferretti (2017), euro area countries most severely affected by the GFC exhibit a declining share of foreign government debt owners, while the opposite holds for the large core euro area countries. As expected, they also show that foreign share rises with the growth rate of the economy and the reduction of capital controls. The negative relation between foreign share and central bank holdings in the case of advanced economies suggests funnelling and concentration of major risks.

Higher level of financial market integration should be followed by lowering of the cost of capital, increasing investment opportunities, and increasing economic growth via international risk sharing (Bekaert and Harvey, 2003). However, the high level of financial integration means also higher sensitivity to global financial crises. In this light, Lehkonen (2014) examines the effect of the 2007-2009 global financial crisis on the financial integration and finds that the effect differs among developed and emerging markets. In particular, the integration increased slightly for emerging markets but decreased for developed markets during the crisis.

1.2. Policy related integration responses to the GFC

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1.3. Recent advances in Measuring International Financial Integration

Financial globalization has significantly increased during the last few decades. The increased integration of the financial systems has involved greater cross-border capital flows, tighter and more stable links among financial markets, and greater presence of foreign financial firms around the world. Indeed, many of the standard aggregate measures of financial globalization such as gross capital flows, stocks of foreign assets and liabilities, and degree of co-movement of returns suggest that international financial integration has become widespread and has reached unprecedented levels (Watson, 1988). As the integration of the financial markets is not a uniform process

that significantly progressed in time, many studies analyse integration utilizing various estimation periods and varying country selections, providing evidence from different methodologies. Due to the fact that integration is a dynamic process it is challenging to measure it. The study by Kearney and Lucey (2004) discussed different approaches to the investigation of integration. There are two main categories of measures that can be used to evaluate the integration of financial markets: direct measures and indirect measures. The first approach, i.e. direct measures, suggests evaluating the extent to which the rate of returns of financial assets, with the same maturity and risk characteristics, are equalized across financial markets. The direct measures approach is based on the so-called law of one price, following the logic that the lessening of regulatory barriers between markets will cause the distribution of capital flows to the most attractive asset classes across the globe, consequently equalising the returns on the assets with the same risk characteristics. However, the main challenge of this approach to measuring integration is to identify assets that are sufficiently homogenous in terms of their risk profiles to make an adequate comparison of the equalisation of financial markets (Kearney & Lucey, 2004, p. 573). Kearney and Lucey (2004, p. 574) further divided the literature on financial integration into three categories, testing: i) the segmentation of equity markets via the international CAPM (e.g., Bekaert & Hodrick, 1992; Campbell & Hamao, 1992; Errunza, Losq, & Padmanabhan, 1992); ii) the extent, and determinants, of changes in the correlation or co-integration structure of the markets (e.g., Bernard, 1991; Gilmore & McManus, 2002); and iii) time-varying measures of integration (e.g., Bekaert & Harvey,1995; Longin & Solnik, 1995; Forbes & Rigobon, 2002; Barari, 2004; Birg & Lucey, 2006; Aggarwal, Lucey, & Muckley, 2003, 2010). While the first two categories demonstrated limited attempts to measure the time-varying nature of integration, the third category of papers used more sophisticated methodologies to capture the dynamic linkages between markets.

In a related stream of literature, Ibrahim & Brzeszczynski (2009 and 2014) proposed a Foreign Information Transmission (FIT) model, which captures time-varying nature of interdependence relationships among markets and allows for variation of parameters over time.

Financial market integration is one of the central themes in international finance and it represents the broader concept of the complex interrelationships among different financial markets. One specific dimension of the financial integration is related to the concept of the co-movement across

financial markets and it is interpreted in terms of the nature and extent of interdependences across asset returns (Kim, Moshirian and Wu, 2006). The literature on the co-movement among international financial markets is very extensive, but it could be generally classified into three main streams. The first stream examines various aspects of the equity market co-movement (Longin and Solnik, 2001; Bessler and Yang, 2003; Brooks and Del Negro, 2004; Kim, Moshirian and Wu, 2005; Graham and Nikkinen, 2011), while the second stream focuses on stock-bond co-movement in a single country or multi-country context (Connolly, Stivers and Sun 2005; Cappiello, Engle and Sheppard 2006; Andersson, Krylova and Vhmaa 2008; Baur and Lucey 2009; Panchenko and Wu 2009; Yang, Zhou and Wang 2009). The third stream is related to the co-movement among international bond markets (Smith, 2002; Yang, 2005; Lucey and Steeley, 2006; Kumar and Okimoto, 2011; Piljak, 2013). An additional stream of related literature concentrates on determinants of financial integration. In the vein of equity markets integration, the earlier studies indicated that macroeconomic factors (business cycle fluctuations, the inflation environment, and monetary policy stance) play important role in explaining equity market co-movement dynamics (e.g. Dumas, Harvey, and Ruiz, 2003; Araujo, 2009; Cai, Chou and Li 2009; Syllignakis and Kouretas, 2011). More recently, financial liberalization, the institutional environment, and global financial uncertainty have been identified as important determinants of financial integration (see Lehkonen, 2014).

Most of the studies on the equity market integration provide evidence of the increasing integration in the recent two decades, but however; there is no consensus in the literature on a well-accepted measure of integration (Pukthuanthong and Roll, 2009). Following early studies on the market integration, several recent papers further advanced the literature on measuring market integration (Carrieri, Errunza, and Hogan, 2007; Chambet and Gibson, 2008; Pukthuanthong and Roll, 2009; Bekaert, Harvey, Lundblad, and Siegel, 2011; Arouri, Nguyen, and Pukthuanthong, 2012; Lehkonen, 2014). In particular, Carrieri, Errunza, and Hogan (2007) propose a measure of integration based on a static asset pricing model that links expected equity returns to local and global risk factors (variances and covariances) and prices of risk. Their model allows risk factors and prices of risk to vary through time. Chambet and Gibson (2008) propose a model that includes global and local factors plus a systematic emerging market factor as a measure of financial integration. They also add indicators of real activity (trade openness and trade concentration) to their proposed measure of financial integration. Pukthuan-

thong and Roll (2009) use a multi factor model for country equity returns to derive a new integration measure based on an adjusted R-square from a multi factor model. Berger and Pukthuanthong (2012) further expand the framework of financial integration analysis in Pukthuanthong and Roll (2009) by providing an estimate of systemic risk within international equity markets. Their propose a market fragility index, which is a risk measure that recognizes periods of systemic risk and therefore high levels of the market fragility index indicate increased possibility of global financial crash. Lehkonen (2014) applies the same measure developed by Pukthuanthong and Roll (2009), but he expands the analysis by examining the relationship between the recent global financial crisis and global market integration. His study provides evidence that although equity market integration has increased over the past three decades,the integration pattern differs among developed and emerging markets (integration has increased slightly for emerging markets but decreased for developed countries during the crisis). Bekaert, Harvey, Lundblad, and Siegel (2011) develop a new measure of the degree of equity market segmentation. Their measure is based on industry-level earnings yield differentials (relative to world levels) aggregated across all industries in a given country. Arouri, Nguyen, and Pukthuanthong (2012) propose a theoretical testable capital asset pricing model for partially segmented markets.More recently, Cordella and Rojas (2017) propose a new measure of financial globalization, the Financial Globalization Index (FGI). This new measure is an asset price correlation measure based on Pukthuanthong and Roll (2009). The novel aspect of proposed measure relative to Pukthuanthong and Rolls measure is that Cordella and Rojas (2017) consider the fact that changes in the correlation between different countries stock markets partly reflect changes in global volatility and they account for those changes.

Some studies within the markets integration literature investigated also the patterns of geographical changes in relative influence of financial markets over time, in particular from the perspective of the evolution of their mutual interdependence in the periods before and after the 2007 Global Financial Crisis (GFC). For example, Ibrahim, Brzeszczynski and Bhattacharjee (2017) analysed this problem for the data from the stock markets in three main geographical regions of Europe, USA and Asia using the Foreign Information Transmission (FIT) model (Ibrahim and Brzeszczyski, 2009) to capture both the direct and the indirect channels of stock-return signal-transmission mechanisms across the three major geographical securities trading centres in London, New York and Tokyo. The results provided by Ibrahim, Brzeszczyn-

ski and Bhattacharjee (2017) indicate that the influence of the US market has weakened after the GFC, while the role of the main trading centres of the other two regions in Europe and Asia has strengthened over time. These findings are consistent with the concept of a geographical shift in the balance of economic powers between countries and they open up a new avenue for future inter-disciplinary research at the intersection of such fields as: finance, economics, political science and economic geography.

2. Sectoral Research Responses to the Challenge

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2.1. Banking, loan and Deposit Markets

Financial integration in traditional banking services has been more reserved in comparison to equity or bond markets (see Degryse and Ongena (2004)). Further scrutiny is therefore needed to understand the drivers behind financial integration (or the lack of it) in banking. Are banks driven by regulatory arbitrage opportunities, by profit motives that derive from pronounced economies of scale, or by risk taking incentives?

Understanding these issues becomes of a paramount importance for the smooth functioning of banking systems of countries with various levels of political, economic, or monetary integration. For example, the recent literature on banking integration in the European Union confirms substantial fragmentation along the national lines. Emter et al. (2017) analyse cross-border banking in Europe after the global financial crisis to find that financial integration in cross-border banking has reversed to some extent after the crisis. They identify non-performing loans as the most important factor that impedes greater integration.Duijm and Schoenmaker (2017) find out that the largest European banks did not fully grab the diversification opportunities. Instead of diversifying into countries with dissimilar economic and financial conditions to obtain the biggest benefit of diversification, banks rather diversify into countries that are similar to their home country.

During the latest global crisis the coexeedances between large banks seems to be particularly strong in the early trading hours due to the influx of overnight information, predominantly from the US. Volatility and to certain extant general market conditions accounted for these coexeedances Lucey and Sevic (2010). Despite fragmentation across national lines, the European banks have diversified their exposures across the global financial system which made them vulnerable to potential shocks stemming from the U.S. subprime mortgage crisis. Abad et al. (2017) confirm that the European banks have largely exposed themselves towards the non-EU entities, particularly, shadow banking entities domiciled in the U.S. Further analysis of the benefits and dangers of integration in banking and the impact on stability in the banking systems is therefore needed.

2.2. Equity Markets

Increasing financial market interconnectedness has been found to be consistent with increasing equity market integration (e.g., Erb, Harvey & Viskanta, 1996; Forbes & Rigobon, 2002; Hardouvelis, Malliaropulos & Priestley, 2006; Kearney & Poti, 2006), and is seen to be driven by markets forces (e.g., increasing international trade, increasing business cycle synchronization, low and convergent inflation and interest rates etc.) but constrained by regulatory barriers (Aggarwal, Lucey & Muckley, 2010). Similar to the correlation between financial markets, international equity market integration varies over time and among markets. It is a dynamic process which is often considered in literature within the context of increasing financial liberalization, globalization and economic development. According to the generic definition, as stated in Lagoarde-Segot and Lucey, (2006, p.17), the integration of financial markets means that all potential market participants with the same characteristics (i) face a single set of rules when they decide to deal with financial instruments, (ii) have equal access to these financial instruments, and (iii) are treated equally when they are active in the market (Baele et.al, 2004). More specifically, increased financial market integration manifests itself in the absence of arbitrage opportunities among markets situated in different geographical regions. Therefore, integration of financial markets leads to an intensification of equity market interconnectedness at both intra-regional, and inter-regional, levels.

The investigation of the information transmission mechanisms, including responses to the common macroeconomic shocks of the financial markets, as well as transmission of shocks occurring on one of the markets compared to

other markets, are used as direct measures of integration. Coelho et al. (2007, p.456) the direct approach is considered to be preferable among researchers, despite the complexity in finding reliable data and a method to prove the existence of integration. One of the methods used, for example, by Coelho et al (2007) is a rolling and recursive minimum spanning tree (MST) to assess the evolution of integration among 53 equity markets for the period from 1997 to 2006. The MST methodology provides useful visualisation of the interconnectedness between large set of markets, that can be also applied dynamically to capture the evolution in patterns of stock market linkages over time. The results obtained by Coelho et al. (2007) show that the developed European countries have consistently constituted the most tightly linked markets among the countries in the sample.

Birg and Lucey (2006) employed methodology proposed by Akdogan (1996, 1997) and is further extended by Barari (2004), to measure global equity market integration based on the international risk decomposition model, where integration scores are calculated as a fraction of systematic risk in total country risk vis--vis the global benchmark. This measures the contribution of a particular market to global risk. Integration scores calculation involves the use of a countrys beta against the global benchmark portfolio (Birg & Lucey, 2006, p.4). The findings demonstrate that developing European markets (i.e. Estonia, Hungary, the Czech Republic, Lithuania, and Poland) have become more integrated with both regional and global equity markets. The comparative examination of regional and world integration measures suggested by this methodology is highly important. Although a market can become less integrated with the world, its significance in a region may increase, consequently increasing the degree of regional integration, especially in the light of the formation of regional economic and political alliances (Birg & Lucey, 2006). However, true price discovery may be hampered by investor behaviour. Investors continue to display a reluctance to invest in either geographic or culturally distant countries. Although similar benefits to overseas investments can be achieved via investment in internationalised firms (Farooqi et al 2015, Fillat et al, 2015 Krapl 2015), investors do not seem to recognise these benefits. Investors could invest more heavily in internationalised firms as a hedge for domestic exposure, especially in times of declining domestic markets. However, the opposite has been found to be the case, US investors prefer domestic firms to internationalized firms in declining markets, whether before or after the 2008 credit crisis, while accounting for size, risk and growth effects. In declining markets, domestic firms outperform

internationalized firms by more than any underperformance in advancing markets (Berrill, Lucey, O'Hagan-Luff 2017). Kearney and Lucey (2004)) highlight a challenge to measuring integration is in identifying assets that are comparable in terms of risk. However cultural differences across nations present particular challenges to establishing this that have not been sufficiently addressed. Risk profiles are a reflection of the difficulty of resolving asymmetric information (Hart (2001) HART (2001)). However the relationship between levels of asymmetric information and levels of perceived risk are conditioned by cross-national differences in social trust (Fukuyama (1995) Fukuyama (1995)). In order to have comparison of assets across nations there needs to be a calibration of both social trust and levels of governance. Further, levels of both social trust and national governance are shaped by differences in national culture. Goodell (2017). Therefore culture will have an impact on transaction costs. As it is difficult to compare assets across markets that are not institutionally integrated, cultural differences establish subtle but meaningful barriers to institutional integration.

Furthermore, similarities as well as differences become visible when examining the financial integration through the lens of the IPO markets. Similar variability in number and volume of IPO filings are prevalent for the USA, the UK and Germany since 2001. Especially, crises such as the burst of the dot.com bubble or the latest global financial crisis, seem to affect the numbers of IPO filings and IPO withdrawals in these developed equity markets in a similar manner (Helbing and Lucey, 2017).

In particular, the determinants of IPO success and withdrawal are of special interest to consider financial integration of equity market interconnectedness at both intra-regional, and inter-regional level. The recent working paper by Helbing and Lucey (2017) identify determinants of IPO withdrawal in the United Kingdom and Germany from 2001-2015 and find similarities to previous US based studies as well as marked contrasts. For instance, while Dunbar and Foerster (2008) find that underwriter reputation as well as Venture Capital involvement is key to a successful listing of an IPO, Helbing and Lucey (2017) cannot confirm the hypothesized positive signalling effect for the two largest and most developed equity markets in Europe. They argue that the specific nature of the universal operations of banks in Germany in particular combined with the immaturity of the risk capital markets in Europe are in stark contrast to the financial structures in the USA. However, US findings are not unanimous regarding the effect of Venture Capital involvement. While Busaba et al. (2001) find that backed companies are less

likely to succeed their IPO after withdrawing, Dunbar and Foerster (2008) identify Venture Capital involvement as key for a successful return to the equity market. Considering the time period of the sample, this might support the time-varying argument of financial integration on a national level.

Also, Helbing and Lucey (2017) find that better Corporate Governance prior to an IPO decreases the probability of its withdrawal which supports the US findings of Boeh and Southam (2011). Though, each country seem to places its emphasis on individual Corporate Governance metrics, overall the results argue in favour of financial integration in terms of Corporate Governance and IPO markets. The analysis of Helbing and Lucey (2017) also shows pronounced similarities in the determinants of IPO withdrawal for the UK and Germany which enforces the argument that developed European countries are most tightly linked (Coelho et al., 2007). Further studies on financial integration of IPO markets which examine underpricing in European countries include Goergen et al. (2009) or Engelen and van Essen (2010).

The knowledge about interconnectedness of equity markets can be also very helpful for stock market investors in construction of their trading strategies that exploit the information not only from the domestic market, where the trades are executed, but also from other foreign markets which spill over volatility and transmit returns to other markets, which are aligned next in the particular geographical markets sequence. There exists evidence that inclusion of the information from the foreign markets, which is measured by models which capture interdependence and interconnectedness effects, substantially improves performance of such investment strategies (see e.g. Ibrahim and Brzeszczynski, 2014).

2.3. Bond Markets

The financial integration of government bond markets is important topic in international finance, since it has important implications for monetary policy-making independence and bond portfolio diversification (see e.g. Yang, 2005). Despite having relevant practical implications, the topic of bond markets financial integration has received less attention in the literature than equity market integration. Most of the literature on government bond markets integration has been traditionally focused on developed markets, especially in eurozone and G7 economies (Christiansen, 2014; Kumar and Okimoto, 2011; Pozzi and Wolswijk, 2012; Abad, Chulia and Gomez-Puig, 2014). For instance, Pozzi and Wolswijk (2012) examine the time-varying integration of euro area government bond markets. Their main finding is that the markets

were almost fully integrated by the end of 2006, but during the 2007-2009 financial crisis the degree of integration has decreased. Kumar and Okimoto (2011) use sample of the largest G7 economies (excluding Japan) to examine whether government bond markets of those countries were integrated in the period before the onset of the crisis. In addition, they address the question to what extent did the integration at the short and long end of yield curve differ and find that integration at the long end of the yield curve had been increasing and it was significantly greater than at the short end. Christiansen (2014) finds that government bond integration of EMU countries is stronger than that of non-EMU countries and also stronger for old EU members relative to the new EU members. Abad, Chulia and Gomez-Puig (2014) show that level of government bond integration for all European countries is time-varying and it decreases after the beginning of the global financial crisis in August 2007. More specifically, integration was slowing down as markets moved towards higher segmentation following onset of the crisis, which highlighted differences of country risk factors across European markets. By analysing EMU and non-EMU countries separately, they also find out that the financial crisis had much more negative effects for EMU members sovereign bond market comparing to non-EMU members.

One specific stream of the literature on bond market integration concentrates on emerging and frontier markets as well. For instance, Bunda, Hamann, and Lall (2009) use adjusted cross-country correlations to examine the roles of common external and idiosyncratic factors in explaining bond markets co-movement in emerging markets, while Piljak (2013) investigates co-movement dynamics of emerging and frontier government bond markets with the US market and the driving forces behind the time-varying co-movement. More recently, Piljak and Swinkels (2017) analyze the time-variation in correlation of US dollar-denominated frontier government bond markets with respect to emerging bond markets, the US corporate bond market, and the US Treasury.

Future research on bond market integration could focus on identifying the most relevant factors affecting government bond integration and examining whether the effect of those factors differ between developed and emerging bond markets. Distinction between developed and emerging government bond markets is important in this context, given that emerging markets bonds are often perceived as equity-like assets due to high country risk (see Piljak, 2013). This implies that importance of certain determinants of market integration might differ among developed and emerging markets. In particu-

lar, political risk factor, development of financial system, and sovereign credit ratings might be more significant in affecting emerging bond markets relative to developed bond markets. Another future avenue for research in bond market integration would be development of bond market integration measure, which would be used to measure co-movement dynamics between bond markets internationally. Creating of such a measure is a challenging task, given complexity of factors (country-specific and global) that are impacting government bond pricing on individual country level and co-movement at cross-country level.

2.4. Commodity Markets

Since the classical work by Working (1949) and Brennan (1958) on the theory of storage, commodities have been extensively studied over the years. In particular, Pindyck and Rotemberg (1990)s pioneering study set the foundation for the concept of co-movement: the persistence of the prices of largely unrelated commodities to move together. This concept was later extended by Cashin, McDermott, and Scott (1999), who introduced a measure of so-called concordance: the proportion of time that the prices of two commodities are simultaneously in the same slump or boom period. More recent examples of this literature are Ai, Chatrath, and Song (2006), Lescaroux (2009), Natanelov, Alam, McKenzie, and Huylenbroeck (2011), De Nicola, De Pace, and Hernandez (2014), and Fernandez (015a), among many others.

Irwin and Sanders (2011) detail how commodity investment flows have increased from $15 billion in 2003 to $250 billion in 2009. This increase in volume is attributed to the *financialization* of futures markets that began in the early 2000s. Cheng and Xiong (2014) state that since the *financialization*, commodity futures now represent an additional asset class that sits alongside stocks and bonds. The entrance of this new cohort of investors, however, significantly changed how commodities interact with other assets (Adams and Glück, 2015). More precisely, as commodities began to command a greater proportion of market participants' portfolios, they were traded in a manner similar to equities. This is in contrast to earlier conclusions of commodity prices being only weakly correlated with equity markets (Bessembinder and Chan, 1992).

Over the years new statistical techniques have been devised to gauge co-movement among a set of financial assets. For instance, Kenett, Huang, Vodenska, Havlin, and Stanley (2014) developed the concept of influence: the average partial correlation of one asset with respect to others. Based on

price information for the period of January 1968-December 2013, Fernandez (2015b) found that there was strong co-movement among the average influences of nominal returns of industrial and precious metals since 2003. On the other hand, and as expected, average influence among unrelated commodity returns was found to be generally negligible, except for the period of financial turmoil of 2007-2010. New techniques to measure co-movement include also network theory. See, for instance, the recent article by Diebold, Liu, and Yilmaz (2017) which finds that commodity clustering generally matches industry grouping, while energy, industrial metals, and precious metals are firmly connected.

On the other hand, it appears that in recent years a new strand of the literature is under way: resources finance. That is, a bridge between the finance and renewable/non-renewable resources literature. Here the examples are numerous, particularly in regards to strategic metals (e.g., rare-earth elements, indium, iridium, rhodium) and precious metals. Recent contributions include Batten et al. (2010), Aruga and Managi (2011), Ishee, Alpern, and Demas (2013), O'Connor et al. (2015), Ge, Wang, Guan, Li, Zhu, and Yao (2016), and Lau et al. (2017) - see also the special issue on white metals coming up in this journal. Indeed, in that spirit, a change in the nature of white precious metals can be observed, shifting from commodities to investment assets (Vigne et al. (2017)). An interesting question is to understand whether this reflects an actual need for more diversification assets, or whether this is a mere reflection of a growing finance industry that turns commodities into new products to be placed to investors. In any case, the macroeconomic determinants of white precious metal prices are changing and so should the views of researchers.

2.5. Risk Management

Major types of risk corporations might be exposed to include commodity price risk, interest rate risk, and/or foreign exchange risk. For example direct and indirect foreign exchange rate exposure occurs when firm value is impacted by fluctuations in foreign exchange rates. Hutson and Stevenson (2010) and Aggarwal and Harper (2010) suggest that the globalization of product markets has heightened indirect relative to direct foreign exposure. Bartram, Brown and Minton (2010) suggest that foreign exchange rate exposure can be mitigated via financial and operational hedging techniques. Hutson and Laing (2014) examining 953 US multinational firms report strong evidence that operational and financial hedging mitigates foreign exchange

rate exposure. Examining the GFC period they find that the effectiveness of financial hedging diminishes and suggest that operational hedging could potentially provide stronger protection than financial hedging during times of heighted exchange rate volatility. Laing, Lucey and Luetkemeyer 2017 examining the US oil and gas industry find significant exposure to commodity price risk. They report no evidence that operational hedging is effective; rather that financial hedging is significant and impactful in reducing commodity price exposure. Consistent with Hutson and Laing (2014) they find that the effectiveness of financial hedging diminishes during times of stress. Asness et al. (2009) claim that in 2008 it was rather difficult to apply financial hedging strategy in the convertible bond markets due to the lack of liquidity. Any claim for redemption forced market agents to sell convertible bonds and increase the "cheapness" of the financial asset. Accordingly, even potentially profitable strategies had to be abandoned due to short squeeze and the necessity to close both long and short positions. An interesting future research question is to understand how firms operating in integrated global financial markets can successfully mitigate risk during periods of high volatility.

2.6. FinTech

Over the last decade, technology advancement has transformed the financial services industry at an accelerated pace. From digital currencies to the use of Blockchain in financial transactions, the financial world is innovating at a rapid pace. However without regulation and understanding of the technology and its impact to the sector, FinTech could do more harm than good. Sas and Khairuddin (2017) highlight that the lack of regulation in Bitcoin's crytocurrency blockchain technology leave users open to hacking, fraud and theft.

Therefore there needs to be a growing literature on FinTech and its impact on the financial sector. Possible topics include big data analytics, social media analytics, textual sentiment analysis, agent based models and simulation, Blockchain and distributed ledger technologies, disintermediation of long established institutions (e.g. banks), high frequency trading strategies, machine learning, cryptocurrencies, digital wallets, peer-to-peer payments, financial transactions in the Internet-of-Things, asset allocation and risk management as well as crowdfunding. These topics are not exhaustive but outline a few areas that academic research could pursue in this rapidly advancing field.

2.7. Alternative Investments

Another promising area for future research toward financial integration is the area of alternative investments (e.g. hedge funds) and the impact that can have on the stability of the system. Currently, hedge funds are not regulated by SEC. They have a private nature and all the characteristics derive from it (Lhabitant, 2004). As the general public has no access to this pool, regulators regard this pool as not a traditional investment vehicle such as mutual funds, portfolio stocks, bonds or cash, so there is no need to regulate them nor any need for disclosure. Hedge fund managers are not obliged to disclose their underlying investment practices and there is no obligation to conform to the requirements of registered investment companies. In addition, the manager may pursue a wide range of financial instruments and any type of investment strategy even if this include short selling, derivatives, leverage, real-estate, non-listed or illiquid securities. In recent years there is going to be a pressure for more transparency and regulation toward hedge fund. Thus this is a good opportunity to examine how these potential changes can have an impact on how the funds operate in relation to the market operation as well.

More specifically, an emerging area of interest is the risk capital market with Venture Capital and Private Equity firms on an intra- and inter-regional level. Groh et al. (2010) elaborate on a country specific attractiveness index for Venture Capital and Private Equity investments. Despite integrating markets in Europe, differences in the risk capital markets remain severely pronounced, in particular for the largest economies (Tykvova and Walz, 2007).

2.8. Bank liquidity

The 2007-2009 financial crisis that caused not only the collapse of the financial system but also huge negative externalities to the entire economy has highlighted the liquidity management problems facing by banks. When banks fund more long-term illiquid assets with less short-term debt, they are more likely to become unable to rollover their borrowing during the financial crisis (Brunnermeier 2009, Diamond and Rajan 2009, Afonso et al. 2011, Acharya and Merrouche 2013). In the wake of the subprime crisis, banking regulations have been re-writting all over the world with the aim of gaining the public trust and the bank stability. The Basel Committee on Banking Supervision (BCBS 2013) introduced a quantity-based liquidity standard, named Basel III, to strengthen bank liquidity risk management practices. This represents a starting point to quantify individual banks market-implied vulnerability to system-wide funding constraints during the period of stress.

Acknowledging how the new liquidity standard influences the financial sector is important in the Basel III reform process. The topic on bank liquidity is raised at a time of significant Basel III reform, therefore, could propose significant contributions for the future regulatory implications before its first implementation in the next few years.

2.9. Derivatives Markets

Merton and Bodie (1995) identify six core functions performed by the financial system to facilitate the allocation and deployment of economic resources:

1. To provide ways of clearing and settling payments to facilitate trade.
2. To provide a mechanism for the pooling of resources.
3. To provide ways to transfer economic resources across time and space.
4. To provide ways of managing risk.
5. To provide price information.
6. To provide ways of dealing with incentive problems.

Haiss and Sammer (2010) distil these functions into three derivative-specific channels, through which derivatives influence the integration of financial markets and economic development. Namely, the volume channel, the efficiency channel and the risk channel.

The **volume channel** facilitates and increases the accumulation of capital - derivatives markets have become very successful in pooling enormous amounts of capital. The **efficiency channel** enables efficient substitution of cash market trades, transferring resources across time and space. Currency and interest rate swap derivatives allow borrowers and investors to allocate or obtain capital efficiently to & from the cheapest/most efficient foreign markets. The final channel, the **risk channel**, enables investors to cap their exposure to risky trades enabling agents such as pension fund managers with risk averse clients to increase potential yields while capping losses through the purchase of put options.

While the potential benefits of liquid derivatives markets are uncontentious there is a question as to whether these come at too high a price, as the complexity and high leverage available in the products also leverage risk exposure. A number of researchers have questioned whether financial derivatives were to blame for the global financial crisis in 2008 (see e.g. Duffie (2008), Murphy (2009) and Greenberg (2010)).

The ongoing challenge in derivatives markets is in how to continue to encourage innovations that benefit the financial system while carefully regulating to mitigate the impact of leverage on systemic risk. The high leverage available in derivatives markets can incentivize risk-taking in institutional traders with an asymmetrical payoff function (who share in trading profits but do not contribute to losses). Recent regulatory changes in 2014 in the EU attempted to address this through limits on trading bonuses however, as noted by Murphy (2013), regulatory intervention can have unintended negative consequences, potentially even increasing the risks it was introduced to avoid.

2.10. Financial market wide dependences

International financial markets are a network, which are influenced by the macro economy, policy decisions, and institutional factors. An important element in future research regarding financial market connectedness is not only the connectedness within one asset class (e.g. equity markets) or between two asset classes (e.g. equities and bonds), but the simultaneous connectedness between a wide variety of asset markets: equities, bonds, FX, commodities, bonds, housing markets etc. Only by understanding the changing relationship between the different asset classes, and how the changing dependence structure between two markets affect the other markets, can we better understand financial market interconnectedness. Steps in this direction are taken by e.g. Diebold and Yilmaz (2009, 2012, 2014, book in 2013) in their many papers on connectedness, their approach building on network analysis and GVAR models. Developing models able to handle large data sets efficiently will be crucial. Network analysis can be a useful tool in the future.

One crucial development in the future is being able to forecast how connectedness changes over time, for example due to the changing economic situation (e.g. business cycles), the policy environment (e.g. accommodating monetary policy), or the institutional framework. This would improve our ability to forecast the financial markets and economic developments in general. This applies to both the across asset class connectedness, and the within asset class comovements.

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