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EVIDENCE ON THE IMPACT OF THE TROUBLED ASSETS RELIEF PROGRAM ON STOCK RETURNS

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ABSTRACT

In response to the global financial crisis which began in 2008, the US government launched the Troubled Assets Relief Program (TARP), the largest government bailout in US history. TARP was controversial and publicly unpopular. This article examines the market responses to the TARP-related events as reflected in stock returns. Our empirical strategy permits a counterfactual interpretation of the data and provides empirical evidence to answer the question "what would have happened to those banks that did in fact receive bailout funds if they had not received the bailout." We find that the market responded favorably to the announcement of TARP, which suggests that the bailout program launch helped restore investors' confidence in the financial system. However, the market reacted negatively to the receipt of TARP bailout funds. Hence, instead of ensuring certification, receiving bailouts generated an adverse market signal. Our empirical evidence suggests that TARP receipt rather than the announcement by banks to accept TARP funds was essential.

JEL: G18, G21, G28

KEYWORDS: TARP Bailout, Abnormal Returns, Tail Risk, Financial Crisis, Counterfactual

INTRODUCTION

"It's very hard to know the counterfactual." Mervyn King, the Governor of the Bank of England, before the Treasury Select Committee on the Financial Crisis, March 2009. Banks can face distress and a consequence of "too big to fail" is a rescue package from the central bank using taxpayer funds which the largest banks can be pressured to participate in (Calomiris & Khan, 2015). On October 3, 2008, the Troubled Asset Relief Program (TARP) was announced, the largest government bailout in US history. It authorized the US Department of the Treasury to inject capital into banks. This injection sometimes occurred regardless of whether the banks needed capital or not. TARP's objective was to persuade investors and consumers of the safety of the banking sector, to bolster lending, and prevent bank runs. How far TARP restored investor confidence by stabilizing financial markets and helped banks survive the global financial meltdown remains an open question. Whether TARP hindered or even worsened the financial crisis remains open to debate among policymakers, academics, and the general public. Several distinguished academic economists wrote to the US Congress protesting TARP. It rapidly became a favorite punching bag of the public, Republicans, Democrats, conservatives, and liberals.

In October 2009 a Bloomberg poll questioned how TARP had impacted the economy. Samuelson (2011) reports that 24% said it strengthened the economy, 43% said it weakened the economy, 21% said it did not impact the economy, and 12% were uncertain. Pundits in the Wall Street Journal, the New York Times, etc. criticized TARP. Implementing TARP into law even induced one member of Congress to state that "this may be the day America died." TARP closed December 19, 2014 yielding the US government a $15.3 billion profit (Isidore, 2014). The heated debate over TARP has underscored the fact that economic theories can rarely explain with certainty whether one set of policies is superior to another or is certain to succeed

in a given circumstance. Indeed, for every example of success with TARP, opponents are quick to show failures with it. Critics argue that conditions would have been better without TARP, implying that financial markets would have recovered faster and stronger without bailouts. They also point to apparent successes with alternative policies. Taylor (2009) concludes that "government actions and interventions caused, prolonged and worsened the financial crisis". In contrast, Blinder and Zandl (2010) argue that

> *"If policymakers had not reacted as aggressively or as quickly as they did, the financial system might still be unsettled, the economy might still be shrinking, and the costs to U.S. taxpayers would have been vastly greater."*

La Monica (2009) reports that "many big-bank executives argued that they only took TARP funds because they were strong-armed into it and thought not taking the cash would make them look weak and unworthy of government support." Yet, evaluating public policies is:

> *"… a taxing task. It remains impossible to assess the consequences of a path not taken. TARP passed; we know what occurred. We cannot say with certainty what would have occurred if TARP had not passed or if the government had pursued another option."*

Let us consider three challenges and how to address these. First, a crucial challenge to any article on the topic of TARP is to clearly carve out the contribution relative to earlier analyses of TARP and related programs, see e.g. Liu et al. (2013) or Cornett et al. (2013). Second, it is generally hard to draw causal inferences from event studies. One challenge pertains to the negligence of cross-sectional dependence of equity returns. Kolari and Pynnönen (2010) demonstrate systematic over-rejection of the null of CAR when neglecting cross-sectional dependence. The latter is common during systemic crises, with uncertainty about the resilience of the banking system, cf the literature on bank runs (De Graeve & Karas, 2014; Diamond & Dybvig, 1983). Third, and related, causal inference should make a compelling case that equity market responses and (systemic) risk reactions are solely attributable to TARP rather than various other measures taken by the Federal Reserve System, e.g. emergency liquidity facilities (Berger, Black, Bouwman, & Dlugosz, 2017). The objective of this article is to consider the counterfactual question: what would have happened to those banks that did in fact receive bailout funds if they had not received the bailout? Clearly, this exact counterfactual is not observable as a single bank cannot simultaneously receive and not receive a bailout. This problem is referred to as the fundamental problem of causal inference (Holland, 1986). To address this problem we use propensity score stratification matching to select a control group of non-bailout banks that is closely matched to the group of bailed-out banks to artificially create such twins. We then use the matched groups to estimate the market's response to banks' bailout decisions in terms of stock market returns and systemic tail risk.

A causal effect is defined as the difference in outcome between a world in which the bank receives the treatment and a counterfactual world in which the same bank does not. The treatment is acceptance of TARP bailouts by certain banks and financial institutions. Estimates of effects in this framework are the effect of treatment on the treated (ETT) on those banks that accepted the bailout. In other words, in estimating the effect of TARP bailouts, we are estimating the effect on those banks in the data who actually accepted bailout funds, not the hypothetical effect of bailouts on any bank which could conceivably have received bailout funds. In addition, the estimates from the model are estimates of the average treatment effect, rather than the effect on each individual bank.

Whilst TARP funding issues have been researched by scholars including Bayazitova and Shivdasani (2012) and Veronesi and Zingales (2010) among others, this to our knowledge, is the first article to examine the market's response to TARP funding receipt events as reflected in stock returns. Most significantly, we allow for non-random selection into the TARP bailout program by using propensity score matching methods. This strategy permits a counterfactual interpretation of the data. Nevertheless, all counterfactual experiments are

subject to the Lucas critique that the robustness of the results are questionable and need to be interpreted with caution. The empirical methods used in earlier studies listed in the literature review below cannot provide credible empirical evidence of causality between TARP bailouts and outcomes of policy interest. In other words, the methods cannot estimate the average treatment effect on the treated. Neither do any of the previous methods account for unobservable heterogeneity. The decision to receive bailouts is not exogenous to banks. Each bank self-selects into either the bailout or no-bailout regime. Therefore, estimates that do not account for self-selection may be biased. In order to correct for such bias, Heckman selection or instrumental variable approaches could be used. Yet, these approaches still assume that the outcome equations would differ only by a constant term between bailout and non-bailout banks. In reality, differences between the two groups may be more systematic. That is, there may be interactions between bailout choice and the other determinants of bank outcomes.

During financial crises, parameter estimation does not capture phenomena outside the crises. In particular, during financial crises the beta of the CAPM of bank stocks increases causing underestimation of future stock returns. Our approach nevertheless seeks to capture the fundamental stock market return, and to interpret the remaining noise as the abnormal return. Lessons continue to be learnt from the crisis and there is much interest in understanding the consequences of regulatory innovation and intervention (Beck, 2014; Mishkin, 2017). However, with the exception of Duchin and Sosyura (2012), previous studies do not construct an appropriate counterfactual group of banks that do not accept bailout funds. Constructing an appropriate counterfactual group of banks is essential for studying the impact of TARP. For example, suppose firm value is seen to decline after TARP. Without a counterfactual one would not be able to determine whether it would have declined even more if firms that actually did accept bailout funds had not accepted bailout funds. Even though this cannot be observed, their hypothetical behavior can be proxied by the behavior of a sample of other banks that did not accept bailout funds.

Attempts to use propensity score matching alone, without some form of structural model, are futile because of the inability of capturing the policy impact of interest, i.e. the average effect of the treatment (receipt of bailout funds) on the treated (banks receiving these funds). Propensity score matching can deal with structural differences between bailout and non-bailout banks, but only to the extent that these differences are based on observables. When unobserved factors simultaneously influence banks' bailout decisions, and the financial health of the banks, such as managerial skills, ability, or motivation, then propensity score matching may still result in biased estimates. For the CoVaR calculation, using only the market value of bank assets would be problematic. Book leverage is only observed a few times per year, and during the crisis it was possible for leverage to change quickly and dramatically. This could create artificial drops in the estimated market value of bank assets, and thus create error with estimating values of CoVaR. The article is organized as follows. The next section provides a literature review and discusses the background and events leading up to TARP. The section thereafter describes the data and methodology, and the characteristics of banks in our sample. The section thereafter presents the results including empirical evidence on the impact of TARP bailout events on stock returns. The final section concludes. In a subsequent article, Ncube and Hausken (2019) consider TARP bailout size, buy and hold returns, and tail risk.

LITERATURE REVIEW AND BACKGROUND

Literature Review

Recognizing the difficulty of pinpointing causal effects in empirical social science research, a large and influential body of work has developed methods for credible causal inference of the effects of a policy, program or treatment, including J. J. Heckman (1979); J. Heckman (1990); Angrist, Imbens, and Rubin (1996); Abadie, Angrist, and Imbens (2002); and Angrist (2004). Scholars have attempted to evaluate the costs and benefits of TARP, and the impact of TARP on the real economy and on bailout policies. For

instance, Veronesi and Zingales (2010) estimate the costs and benefits of TARP (which they refer to as Paulson's gift) and show that this government intervention increased the value of banks' financial claims by US $130 billion at a taxpayers' cost of $21–44 billion with a net benefit between $86–109 billion. Taliaferro (2009) studies the way banks used new capital under TARP. He finds that participating banks used roughly 13 cents of every program dollar to support new lending, while they retained a considerable portion, about 60 cents of every dollar, to shore up their capital ratios. Bayazitova and Shivdasani (2012) study selection into TARP and subsequent stock price reactions, suggesting a positive announcement effect. Ivashina and Scharfstein (2010) demonstrate a relationship between credit line commitments and loan growth during the 2008 crisis.

Aït-Sahalia, Andritzky, Jobst, Nowak, and Tamirisa (2012) do not find strong evidence that either macroeconomic or financial policies had an advantage in calming interbank markets during the global financial crisis. Duchin and Sosyura (2012) study the political influences on TARP fund distributions reporting that political connections enhanced the likelihood of TARP capital infusion. Whilst Li (2013) argues that there is not much to support loans made by TARP banks being of lower quality than those by non-TARP banks, Cornett, Li, and Tehranian (2012) suggest that TARP 'underachievers' have some weaknesses in income production, though these are not consistent, whereas 'overachievers' have liquidity issues which affect their ability to continue lending. Harvey (2008), Bebchuk (2009), and Coates and Scharfstein (2009) critique the design of TARP and discuss various inefficiencies of the program. More generally, the impact of the US program was watched globally. The global financial crisis spread worldwide. The performance of banks in other major economies was impacted (Ding, Wu, & Chang, 2013). Furthermore, there is evidence that high levels of CEO pay were associated with banks being significantly more likely to "escape" TARP (Wilson & Wu, 2012) implying that early TARP exit was associated with resumption of financial health (Li, 2013). Also, compensation of banks was associated with enhancing banks' unwillingness to accept TARP funds (Cadman, Carter, & Lynch, 2012).

Background to TARP

As part of the government's measures in response to the global financial crisis, the Troubled Assets Relief Program (TARP) was the largest government bailout in US history. A brief history of US government bailouts is summarized in Appendix 1. The genesis of TARP lies in the days following the collapse of Lehman Brothers and the rescue of AIG in mid-September 2008. In the aftermath of these events, funding costs for financial institutions escalated sharply due to the widespread fear of a domino effect of collapse among financial institutions that were unable to fund obligations and concerns about counterparty risk. On September 20, 2008, Treasury Secretary Henry Paulson and Federal Reserve Chairman Ben Bernanke sent a financial rescue plan to Congress requesting approval to stabilize the financial system by purchasing troubled assets, primarily those related to mortgage-backed securities (MBS), from banks and other financial institutions. Though this initial plan was rejected by Congress, a modified version was approved on October 3, 2008. President George W. Bush signed into law the Emergency Economic Stabilization Act of 2008 (EESA) which authorized spending of up to $700 billion to purchase or insure troubled assets, in an attempt to unlock credit markets and restore confidence in the banking system. See Bloomberg, October 3, 2008, quoting Representative John Yarmuth in his decision to reverse his vote in favor of the bill "the stock market drop on Monday served as a wake-up call to a lot of people". According to EESA, the term "troubled assets" was defined as:

> *"(i) Residential or commercial mortgages and any securities, obligations, or other instruments that are based on or related to such mortgages, that in each case was originated or issued on or before March 14, 2008, the purchase of which the Secretary determines promotes financial market stability; and*

> *(ii) Any other financial instrument that the Secretary, after consultation with the Chairman of the Board of Governors of the Federal Reserve System, determines the purchase of which is necessary to promote financial market stability, but only upon transmittal of such determination, in writing, to the appropriate committees of Congress."*

On October 13, 2008 the Treasury announced that it would invest directly in the equity of a broad range of financial institutions and that these equity injections would be targeted at "healthy" firms. On October 14, 2008 the US Treasury unveiled the details of its Capital Purchase Program (CPP) which allocated $250 billion towards purchases of preferred stock and equity warrant of US financial institutions. The nine largest financial institutions, including Bank of America, Bank of New York Mellon, Citigroup, Goldman Sachs, JP Morgan, Merrill Lynch, Morgan Stanley, State Street, and Wells Fargo, were identified as the initial recipients of an aggregate infusion of $125 billion. In addition to the nine institutions identified by the US Treasury list, Wachovia, that had signed a definitive merger agreement with Wells Fargo, also received a capital injection. Of the ten institutions that received TARP capital on October 14, 2008 three were investment banks at the time and were not required to report as bank holding companies. Hence, comparable financial statement data and capital ratios for these three institutions are unavailable and we exclude them in our analyses requiring financial characteristics. In all tests, we also exclude Wachovia due to its merger agreement with Wells Fargo.

Other banks were also allowed to apply for the preferred stock investment by the Treasury until November 14, 2008. Capital injection through the purchase of preferred stock would qualify as Tier 1 capital but not dilute the voting power of the existing common shareholders, and thus was expected to be attractive to banks. On the same day, a program to offer government guarantees on new bank debt issues was unveiled, and the ceiling on the Federal Deposit Insurance Corporation (FDIC) guarantee of non-interest bearing transaction accounts at banks was also increased at this time. The new bank debt guarantee initiative was finalized on November 21, 2008 as the Temporary Liquidity Guarantee Program (TLGP) which guaranteed senior unsecured bank debt, within prescribed limits, issued between October 14, 2008 and June 30, 2009. Under CPP, the US Treasury would purchase non-voting senior preferred stock of qualifying financial institutions (QFIs), and banks could apply for this injection in amounts ranging from 1% to 3% of their risk weighted assets (RWA). In addition to senior preferred stock, the US Treasury would receive warrants with a ten year life to purchase common stock of qualifying banks for an amount equal to 15% of the preferred equity infusion. The dividend on the preferred stock was set at 5%, but would rise to 9% after three years. The financial terms of CPP capital were viewed to be very attractive for banks and substantially below the funding costs obtainable in public capital markets for most banks. However, CPP infusions forbade dividend increases on the common shares until the preferred shares were repaid fully and also set limits on executive compensation whereby senior executive benefit plans, severance, and golden parachute agreements had to be terminated or modified.

Following CPP and TLGP, TARP evolved to include several other components including the Public-Private Investment Program (PPIP) to acquire troubled loans and toxic assets from financial institutions and the Term Asset-Backed Securities Lending Facility (TALF) to support the issuance of asset-backed securities (ABS). Our analysis focuses on the CPP program because it remains the cornerstone of TARP and because it targets specific financial institutions, allowing us to study the characteristics of the banks supported by the capital injections. Henceforth, we refer to capital injections under the CPP program as TARP infusions. Since the initial preferred stock investment of $125 billion into the nine financial institutions on October 14, 2008, TARP capital infusions have been made into a large number of other financial institutions.

To participate in the program, eligible financial institutions had to submit a short application to their primary federal banking regulator, namely the Federal Reserve, the Federal Deposit Insurance Corporation (FDIC), the Office of the Comptroller of the Currency (OCC), or the Office of Thrift Supervision (OTS). After receiving the application, the regulators assessed the financial condition of the applicant based on the

CAMELS rating system. If the initial review by the banking regulator was successful, the application was forwarded to the Treasury's investment committee and then the assistant secretary for financial stability who made the final decision about the investment. By July 30, 2009, more than 2,700 applications were filed. 660 of these received bailout funds. 1,300 were transferred to the Treasury.

With the passage of the TARP legislation, banks across the country faced a difficult decision: Should they accept government aid that could help keep them solvent but also open them to criticism of being bailed out? The banks' choice to apply for TARP funds thus was also a function of their own internal deliberations as to expected costs and benefits, managerial tastes, preferences and private information. The announcement of TARP funding was accompanied also by a simultaneous announcement that nine of the largest US banks would receive sizable equity infusions, totalling $125 billion. Eventually, 758 banks took the deal and accepted funds through TARP. Bank receipts of TARP funding reflected the provision of a funding limit up to 3% of Risk Weighted Assets which most banks applied for. Many banks eager to protect their images or unwilling to accept the program's burdens opted against taking the assistance.

DATA AND METHODOLOGY

Sample Characteristics

To construct our main (universal) sample, we start with data available at the bank holding company level from the Bank Holding Company Database provided by Federal Reserve Bank of Chicago. The dataset includes quarterly financial data on a consolidated basis for all domestic bank holding companies (BHCs) with total assets of $500 million or more. The consolidated bank holding company financial data are desirable because the Troubled Assets Relief Program (TARP) is made at the level of holding companies. Our data covers the period from 2005 Q1 to 2010 Q4. We also cover events after 2010 Q4, such as whether TARP funds were received by September 30, 2011. TARP was passed September 20-October 14, 2008, and closed December 19, 2014 (Isidore, 2014). From the universe we obtain two sub-samples. The first sub-sample is BHCs that accepted TARP bailout funds (bailout banks). The list of bailout banks is obtained via ProPublica's TARP database. The sub-sample of bailout banks is used to conduct our basic event study. The second sub-sample is "matched banks" that did not accept TARP bailout funds but are similar to the bailout recipients according to propensity score matching methods (counterfactuals).

More specifically, for the bailout sub-sample, we obtain data on TARP participant BHC from ProPublica's TARP database, which can be found at http://bailout.propublica.org/main/list/index. The database tracks where taxpayer money has gone in the ongoing bailout of the financial system. By December 30, 2011, 926 institutions had received bailout funds of $700 billion (there is a separate bailout of Fannie Mae and Freddie Mac). Since we retrieve financial reporting data from Consolidated Financial Statements for Bank Holding Companies- FR Y-C (Call Report), we limit our sample to bank holding companies with total consolidated assets above $500 million. In addition, we analyze publicly traded banks because our event study employs stock market data. We limit our bailout sub-sample for the event study to banks that participated in TARP and had ordinary shares listed on NYSE, AMEX, or NASDAQ.

Panel A of Table 1 shows that CPP capital of $640 billion was provided to 926 firms, including 758 bank holding companies who received $236 billion in bailout funds. Of the bank holding companies, 247 are publicly traded on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), or NASDAQ Stock Market (NASDAQ). For the non-bailout sub-sample, we start with 977 bank holding companies with consolidated assets of $500 million or more as of September 30, 2008, and therefore have consolidated financial information available from Bank Holding Company Data before the announcement of TARP. After removing the bank holding companies that announced their participation in TARP, we end up with our non-bailout sub-sample. Table 1 presents the selection process for our bailout and non-bailout sub-samples.

Table 1: Sample Selection

Selection Criteria	Bailout Amount	Firm Number
Panel A: Bailout Banks		
Firms receiving bailout funds under TARP	$640 billion	926
Retain bank holding companies only	$236 billion	758
Retain bank holding companies with ordinary shares listed on NYSE, AMEX, or NASDAQ	$227 billion	247
Retain bank holding companies with consolidated assets above $500 million by September 30, 2008	$216 billion	187
Panel B: Non-Bailout Banks		
Bank holding companies with consolidated assets above $500 million by September 30, 2008	N.A.	976
Retain bank holding companies with ordinary shares listed on NYSE, AMEX, or NASDAQ	N.A.	318
Retain bank holding companies not receiving TARP bailout funds by September 30, 2011	N.A.	131

Notes: Reported are the sample selection processes for the study. Panel A describes the construction of the sub-sample of bank holding companies that received TARP bailout funds by September 30, 2011 (i.e. bailout banks or treated group). Panel B describes the construction of the sub-sample of bank holding companies that did not receive TARP bailout funds by September 30, 2011 (i.e. non-bailout banks or control group).

Preliminary Analysis

We classify the banks following FDIC and Federal Reserve Guidelines into one of four size groups based on period-end book value of assets:
Greater than $10 billion
Between $3 billion and $10 billion
Between $1 billion and $3 billion
Less than $1 billion

Table 2: Definition of Main Variables and Source of Data

Variable	Definition	Source
Bailout amount (*BA*)	Amount of TARP funds received by a bailout bank ($billions)	Eye on the Bailout
Bailout ratio (*BR*)	Ratio of the amount of TARP funds received by a bailout bank to the bank's Tier 1 capital (%)	Eye on the Bailout; BHC Data (BHCK 8274)
Capital adequacy (*CA*)	Ratio of Tier 1 capital to total risk-weighted assets (%)	BHC Data (BHCK 8274 A223)
Asset quality (*AQ*)	Ratio of noncurrent loans and leases (90 days or more past due or in nonaccrual status) to total loans and leases (%)	BHC Data (BHCK 5525 5526 5369 B529)
Management quality (*MQ*)	Ratio of annualized total non-interest expense to annualized net operating income (%, net operating income is measured as the sum of net interest income and non-interest income)	BHC Data (BHCK 4093 4074 4079)
Earnings (*EAR*)	Ratio of annualized net income to average total assets (%)	BHC Data (BHCK 4340 2170)
Liquidity (*LIQ*)	Ratio of cash and balances due from depository institutions to deposits (%)	BHC Data (BHCK 0081 0395 0397 BHDM 6631 6636 BHFN 6631 6636)
Sensitivity (*SEN*)	Ratio of the absolute difference between earning assets that are repricable within one year and interest-bearing deposit liabilities that are repricable within one year to total assets (% as a measure of sensitivity to interest rate risk)	BHC Data (BHCK 3197 3296 2170)
Bank size (*SZ*)	Natural log of the book value of BHC's total assets (in thousands of US dollar) at quarter-end	BHC Data (BHCK 2170)
Bank age (*AGE*)	Number of years since the entity's general ledger was opened for the first time and/or the date on which the entity became active (years)	BHC Data (RSSD 9950)
Stock return (*R*)	Daily percentage change in stock price (%)	CRSP US Stock
Index return (*MKT*)	Daily return of the CRSP value-weighted index of all NYSE, AMEX, and NASDAQ firms (%)	CRSP US Stock

Notes: Reported are the main variables used in the study along with their definitions and the sources of data. The bailout data is obtained from "Eye on the Bailout" database provided by ProPublica (http://bailout.propublica.org/main/list/index). Accounting information at bank holding company level is collected from Bank Holding Company Database provided by Federal Reserve Bank of Chicago (http://www.chicagofed.org/webpages/banking/financial_institution_reports/bhc_data.cfm). Income and expense attributed to each quarter is annualized and compared to average asset or liability balances for the corresponding quarter. Stock return data is retrieved from CRSP US Stock Database.

Asset sizes of the BHCs as well as all accounting data are available from Bank Holding Company Data from Federal Reserve Bank of Chicago. All domestic bank holding companies with total assets of $500

million or more are required to file FRY-9C on a consolidated basis. For the bank holding companies with data available we constructed a number of demographics, such as bank size and age, as well as financial variables, such as CAMELS. The main variables used in our analysis are listed in Table 2 along with their detailed definition and data sources.

Table 3 reports the summary statistics of the main variables used in the study. Reported are the mean, 25th percentile, median, 75th percentile, and standard deviation of each variable. The statistics for the financial variables reported in Table 3 are computed based on the Bank Holding Company Data released at the end of September 2008, the latest financial information available before the announcement of TARP on October 14, 2008. Appendix 2 reports the summary statistics for the four size groups.

Table 3: Summary Statistics of the Main Variables for Bailout Banks

Variable	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	No. of Obs.
BA	0.97	0.02	0.04	0.13	3.7338	247
BR	29.34%	24.54%	28.71%	32.20%	0.1641	185
CA	10.01%	9.11%	9.80%	10.73%	0.0160	185
AQ	1.91%	1.07%	1.63%	2.29%	0.0141	185
MQ	67.81%	58.85%	65.45%	73.33%	0.2967	185
EAR	–0.02%	0.06%	0.45%	0.76%	0.0186	185
LIQ	4.20%	2.42%	3.01%	3.82%	0.0642	185
SEN	15.42%	6.13%	13.56%	23.42%	0.1088	185
SZ	15.28	13.99	14.71	15.95	1.8899	185
AGE	21.69	11.00	22.00	26.00	15.2418	185

Notes: The table reports the summary statistics of the main variables used in the study. Reported are the mean, 25th percentile, median, 75th percentile, and standard deviation of each variable listed in Table II. The statistics for the financial variables are computed based on the Bank Holding Company Data released at the end of September 2008, the latest financial information available before the announcement of TARP on October 14, 2008. BA represents bailout amount (in billions $), BR bailout ratio, CA capital adequacy, AQ asset quality, MQ management quality, EAR earnings, LIQ liquidity, SEN sensitivity, SZ bank size (natural log of total assets in thousands $), and AGE bank age (number of years). The detailed definition and data source are available in Table 2.

Table 4 reports the summary statistics for the state variables used to estimate the time-varying $CoVaR_t$.

Table 4: Summary Statistics for State Variables Used to Estimate the Time-Varying $Covar_t$

Variable	Mean	Min.	1%	99%	Max.	Std. Dev.
VIX	21.08	10.02	10.08	69.95	79.13	11.48
Liquidity Spread	12.11	–10.00	–6.00	73.00	116.00	17.27
3-month Treasury Change	–0.23	–100.00	–55.00	26.00	59.00	12.52
Term Spread Change	0.12	–87.00	–41.00	51.00	88.00	15.20
Credit Spread Change	0.10	–34.00	–30.00	35.00	51.00	8.98
Equity Return	0.15	–18.39	–7.72	7.43	13.04	2.81
Real Estate Excess Return	–0.21	–11.00	–8.09	6.79	9.50	2.47

Notes: Summary statistics are presented for the state variables used to estimate the time-varying $CoVaR_t$. Following Adrian and Brunnermeier (2016), we include a set of state variables Mt that are well known to capture time variation in conditional moments of asset returns, and are liquid and easily tradable. The factors are: (i) VIX, which captures the implied volatility in the stock market reported by the Chicago Board Options Exchange. (ii) A short term "Liquidity Spread", defined as the difference between the three-month repo rate and the three-month bill rate. This liquidity spread measures short-term liquidity risk. (iii) The change in the three-month Treasury bill rate. The change in the three-month Treasury bill rate because the change, not the level, is found to be the most significant in explaining the tails of financial sector market-valued asset return. (iv) The change in the slope of the yield curve, measured by the yield spread between the ten-year Treasury rate and the three-month bill rate. (v) The change in the Credit Spread between BAA-rated bonds and the Treasury rate with the same maturity of ten years. (vi) The weekly equity market returns from CRSP. (vii) The weekly real estate sector returns in excess of the market returns (from the real estate companies with SIC code 65-66). VIX index and the three-month repo rate are obtained from Bloomberg; the three-month Treasury bill rate, the ten-year Treasury rate, and BAA-rated bond rate are available from the Federal Reserve Board's H.15 release; the return on CRSP index and the return on real estate sector are obtained from CRSP US Stock database. The spreads and spread changes are expressed in basis points, returns in percentage. Reported are the mean, minimum, 1st percentile, 99th percentile, maximum and standard deviation of each state variable defined above over the period of 2005 to 2010.

Table 5 presents the pair-wise correlation among the main variables for the TARP bailout banks. Again, the statistics for the financial variables are computed based on the latest financial information available before the announcement of TARP.

Table 5: Correlation Coefficient Matrix of Main Variables for TARP Bailout Banks

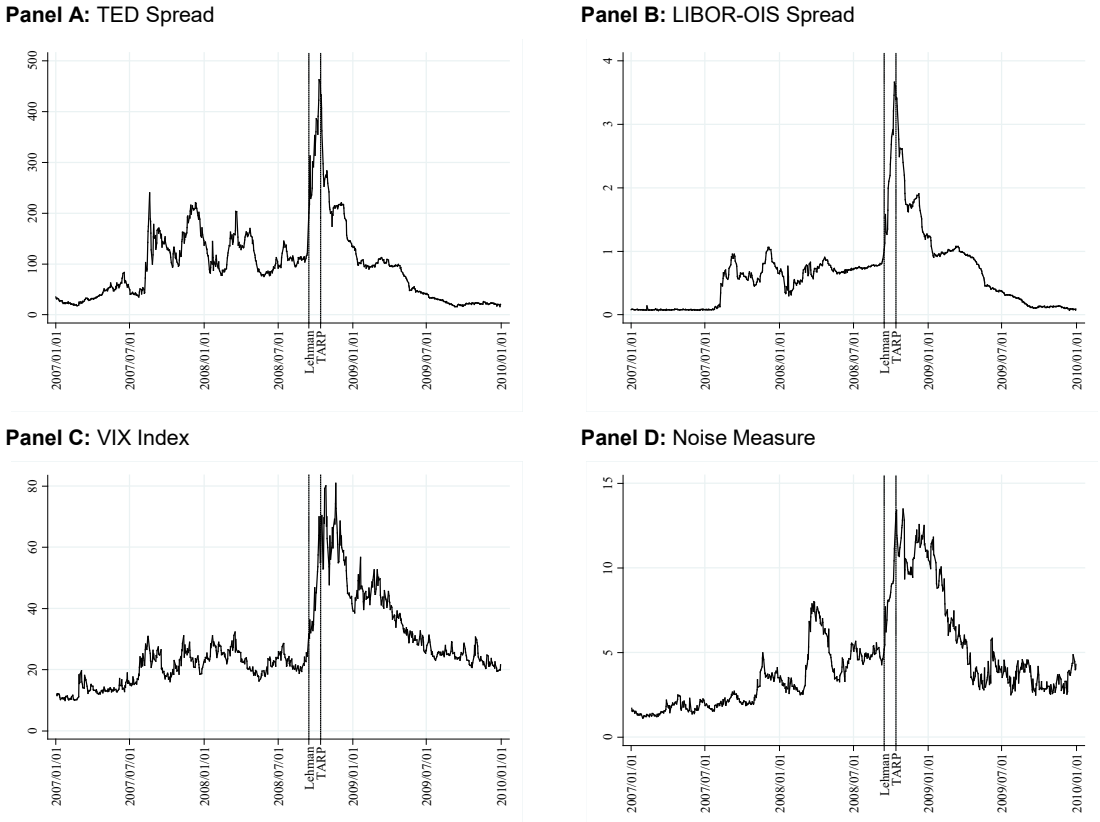
Variable	BA	BR	CA	AQ	MQ	EAR	LIQ	SEN	SZ
BR	0.01	1.00							
CA	–0.29***	–0.25***	1.00						
AQ	0.13*	–0.05	–0.02	1.00					
MQ	–0.01	0.01	–0.18**	–0.23***	1.00				
EAR	0.03	0.01	0.05	–0.33***	–0.48***	1.00			
LIQ	0.21***	–0.02	0.08	–0.07	0.09	–0.01	1.00		
SEN	0.19**	0.07	–0.30***	0.03	0.06	–0.02	0.06	1.00	
SZ	0.74***	0.01	–0.35***	0.13	0.01	0.01	0.37***	0.32***	1.00
AGE	0.57***	0.05	–0.22***	0.08	0.00	–0.01	0.21***	0.13*	0.58***

*Notes: The matrix reports the correlation coefficients between each pair of the main variables used in the study. The financial variables used to estimate the pair-wise correlation coefficients are computed based on the Bank Holding Company Data released at the end of September 2008, the latest financial information available before the announcement of TARP on October 14, 2008. BA represents bailout amount (in billions $), BR bailout ratio, CA capital adequacy, AQ asset quality, MQ management quality, EAR earnings, LIQ liquidity, SEN sensitivity, SZ bank size (natural log of total assets in thousands $), and AGE bank age (number of years). The detailed definition and data source are available in Table 2. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

Apart from the bank-level variables, we also collected time series of the TED spread, the LIBOR-OIS spread, the VIX index, and the "Noise" measure (Hu, Pan, & Wang, 2013). The four time series are plotted in the four panels in Figure 1, with vertical reference lines indicating the date that Lehman filed for bankruptcy (15 September 2008) and the date that TARP was announced (14 October 2008), respectively. The time series data is obtained from Bloomberg. The TED spread, determined by the London Interbank Offered Rate (LIBOR) and denominated in basis points, is the disparity between the three-month US government debt, as expressed by the three-month Treasury bill interest rate, and the three-month Eurodollars contract interest rate. The TED spread indicates perceived credit risk in the economy. Treasury bills are perceived to be risk-free. In contrast, LIBOR expresses the credit risk of lending to commercial banks. Increasing TED spread means that lenders perceive increasing interbank loan default risk (counter-party risk). The LIBOR-OIS spread is the disparity between the overnight indexed swap rate and LIBOR. The spread between the two rates measures the health of the banking system. The three-month LIBOR is a financing floating rate. It vacillates contingent on how a lending bank assesses the risk of a borrowing bank.

The OIS is a swap determined by the overnight rate, which is a fixed overnight interest rate. The spread, in the US, is determined by the Federal Reserve Fed Funds rate and the LIBOR Eurodollar rate. That a lending bank lends to a borrowing bank means that LIBOR is risky. The OIS is perceived to be stable since the counter-parties merely swap the floating interest rate for the fixed interest rate. The spread between the two indicators measures the default probability for the borrowing banks. This expresses risk premiums as contrasted with liquidity premiums. The VIX is the ticker symbol for the Chicago Board Options Exchange Market Volatility Index. It measures the implied volatility of S&P 500 index options. Also known as the fear index, it expresses the market's expectation of stock market volatility over the next 30 day period.

Figure 1: TED spread, LIBOR-OIS spread, VIX index and Noise Measure



Notes: The figure plots the time series of TED spread (difference between 3-month US LIBOR and US Treasury Bill), LIBOR-OIS spread (difference between the 3-month US LIBOR and the overnight SWAP rate), the VIX index from the Chicago Board of Option Exchange, and noise measure over the period of January 1, 2007 to January 1, 2010. The vertical reference lines indicate the events of Lehman's bankruptcy and the announcement of TARP respectively.

RESULTS

Empirical Strategy

We conduct a standard event study to gauge the impact of the TARP bailout size on stock returns. We are interested in two event dates. The first date is October 14, 2008 (the day of the announcement of TARP), and this date is the same for all banks in our sample. The second set of dates is the date that each bank in our sample actually received the TARP funds (the day of receipt), and each bank has a unique date. We estimate bank returns using the following two models. The first model is Markowitz' market model which is specified as

$$R_{it} = \alpha_i + \beta_{Mi} MKT_t + \varepsilon_{it}, t \in [t_0, t_1] \quad (1)$$

where t_0 and t_1 denote the beginning and end of the time window where parameters are estimated (i.e. the estimation window), R_{it} is the daily stock market return of bank i between trading dates $t-1$ and t and *MKT* is defined as the daily return of the CRSP value-weighted index of all NYSE, AMEX and NASDAQ firms.

For the second model include the following Fama-French three factors model

$$R_{it} - RF_t = \alpha_i + \beta_{Mi}(MKT_t - RF_t) + \beta_{SMBi}SMB_t + \beta_{HMLi}HMLM_t + \varepsilon_{it} \quad (2)$$

where *SMB* is a size factor (small minus big) and *HML* is a value factor (high minus low).
We estimate the parameters of Equations (1) and (2) with OLS using a window starting from September 17, 2007 to September 17, 2008 (i.e. the normal period), and use the estimated parameters to predict returns in windows of 2*T*+1 days around the event, i.e. 21 days, 11 days, 7 days, 3 days and 1 day before and after each event, or in other words $[-10, +10]$, $[-5, +5]$, $[-3, +3]$, $[-1, +1]$, and $[-1,0]$, where 0 is the day of the event. The collapse of Lehman Brothers on September 15, 2008, the takeover of Merrill Lynch by Bank America of September 15, 2008, and the bailout of AIG on September, 16 2008, marked the end of the 'normal period' and beginning of the 'crisis period' which triggered the TARP bailout program. The Secretary to the Treasury proposed the first version of the TARP program on September, 20 2008 which was rejected by Congress on September 29, 2008. The revised version of TARP was approved by Congress on October 3 and signed by the President on October 3, 2008. Therefore, what we have considered a 'normal window' in financial markets is at least 12 months before September 17, 2008, before the TARP program was proposed. Later in this section we conduct robustness tests on the results, testing for the impact of other events other than TARP and mere price movement momentum effects. Using the estimated parameters for the Markowitz market model (1), we define Market-adjusted return as

$$\hat{a}_{it} = \hat{\alpha}_i + \varepsilon_{it} \quad (3)$$

Similarly, using the estimated parameters for the Fama-French model (2), we define Fama-French adjusted return as

$$\hat{a}_{it} = RF_t + \hat{\alpha}_i + \varepsilon_{it} \quad (4)$$

We compute the abnormal returns of bank *i* as the deviation of the actual returns from those predicted by the Markowitz market model (1) and the Fama-French three factors model (2). The Fama-French benchmark factors are obtained from Kenneth R. French Data Library. Market capitalization and daily stock returns are retrieved from CRSP database. For the Markowitz market model, the abnormal returns are computed from the equation

$$\hat{\varepsilon}_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_{Mi}MKT_t, t \in [t_0, t_1] \quad (5)$$

Similarly for the Fama-French model, we define the abnormal returns as follows

$$\hat{\varepsilon}_{it} = (R_{it} - RF_t) - \hat{\alpha}_i - \hat{\beta}_{Mi}(MKT_t - RF_t) - \hat{\beta}_{SMBi}SMB_t - \hat{\beta}_{HMLi}HML_t \quad (6)$$

The individual banks' abnormal returns are aggregated using $\hat{\varepsilon}_{it}$ from either Equation (5) or Equation (6) for each trading day (*t*) within the estimation window $[t^* - T, t^* + T]$. The aggregated abnormal return for trading day *t* is

$$AR_t = \frac{1}{N}\sum_{i=1}^{N} \hat{\varepsilon}_{it} \quad (7)$$

Average cumulative abnormal returns CAR_t are derived by summing the abnormal returns over various intervals, i.e.

$$CAR_t = \sum_{\tau=t^*-T}^{\tau} AR_\tau \quad (8)$$

The Announcement of TARP

Table 6 presents the mean, median and standard deviation of the following variables around the day of the announcement of TARP: (a) raw stock returns (b) market adjusted stock returns (c) Fama-French adjusted stock returns (d) market abnormal returns (e) Fama-French abnormal returns (f) cumulative abnormal returns for the market model (g) cumulative abnormal returns for the Fama-French model. The statistical significance of all the above variables are tested and indicated at the 1%, 5% and 10% significance levels, respectively. Standard errors are adjusted for heteroskedasticity and autocorrelation. As shown in the table, even though the average row stock returns of bailout banks in the sample are negative over the event windows of $[-10, +10]$ and $[-5, +5]$ around the announcement of TARP, the adjusted returns, abnormal returns, cumulative abnormal returns are uniformly positive regardless of the model specification and the event window chosen. Bailout banks' stocks responded to the announcement of TARP favorably, implying that the launch of TARP indeed restored investors' confidence in the financial system.

Table 6: Returns Around the Announcement of TARP

Event Window	Variable	Mean	Median	Standard Deviation
[–10, +10]	Raw stock returns	–0.2688	–0.6452	8.3692
	Market-adjusted	0.5314	0.2064	8.0714
	Fama-French adjusted	0.9728	0.7105	7.1287
	Market abnormal	0.5389	0.2593	8.0659
	Fama-French abnormal	1.0452	0.7701	7.1252
	Market CARs	11.3174	10.3874	22.6704
	Fama-French CARs	21.9494	20.3621	28.9470
[–5, +5]	Raw stock returns	–0.3090	–0.7092	9.3334
	Market-adjusted	0.4180	–0.1989	8.9879
	Fama-French adjusted	0.7862	0.3420	7.6155
	Market abnormal	0.4256	–0.1708	8.9862
	Fama-French abnormal	0.8587	0.3821	7.6162
	Market CARs	4.6818	4.0306	12.3306
	Fama-French CARs	9.4462	9.5255	14.2313
[–3, +3]	Row stock returns	0.7431	0.0000	10.5482
	Market-adjusted	1.1624	0.1088	10.2629
	Fama-French adjusted	1.0865	0.5231	8.4742
	Market abnormal	1.1699	0.1840	10.2616
	Fama-French abnormal	1.1590	0.5495	8.4770
	Market CARs	8.1896	7.3756	11.7458
	Fama-French CARs	8.1131	7.0935	11.7179
[–1, +1]	Raw stock returns	1.6564	0.2207	10.3629
	Market-adjusted	1.1580	0.8671	11.3399
	Fama-French adjusted	1.9108	1.3649	9.1580
	Market abnormal	1.1656	0.8097	11.3543
	Fama-French abnormal	1.9834	1.4312	9.1702
	Market CARs	3.4967	1.5815	12.7179
	Fama-French CARs	5.9502	4.8520	11.9421
[0]	Raw stock returns	3.7565	2.0313	10.7747
	Market-adjusted	4.5966	2.4801	10.8843
	Fama-French adjusted	2.9488	2.3082	9.8143
	Market abnormal	4.6041	2.4352	10.9128
	Fama-French abnormal	3.0213	2.3408	9.8427
	Market CARs	4.6041	2.4352	10.9128
	Fama-French CARs	3.0213	2.3408	9.8427

Notes: Summary statistics are presented for the returns of the bailout banks around October 14, 2008 (the day of the announcement of TARP). The sample of banks that accepted TARP bailout funds during the October 2008 to December 2009 period is obtained from ProPublicas TARP database. Stock return data is retrieved from CRSP US Stock database. Reported are mean, median, and standard deviations of raw stock returns, market-adjusted stock returns, Fama-French adjusted returns, market abnormal returns, Fama-French abnormal returns, market CARs, and Fama-French CARs in event windows of 2T+1 trading days around the announcement of TARP, i.e. 21 days, 11 days, 7 days, 3 days and 1 day around October 14, 2008. The return variables are defined in the text.

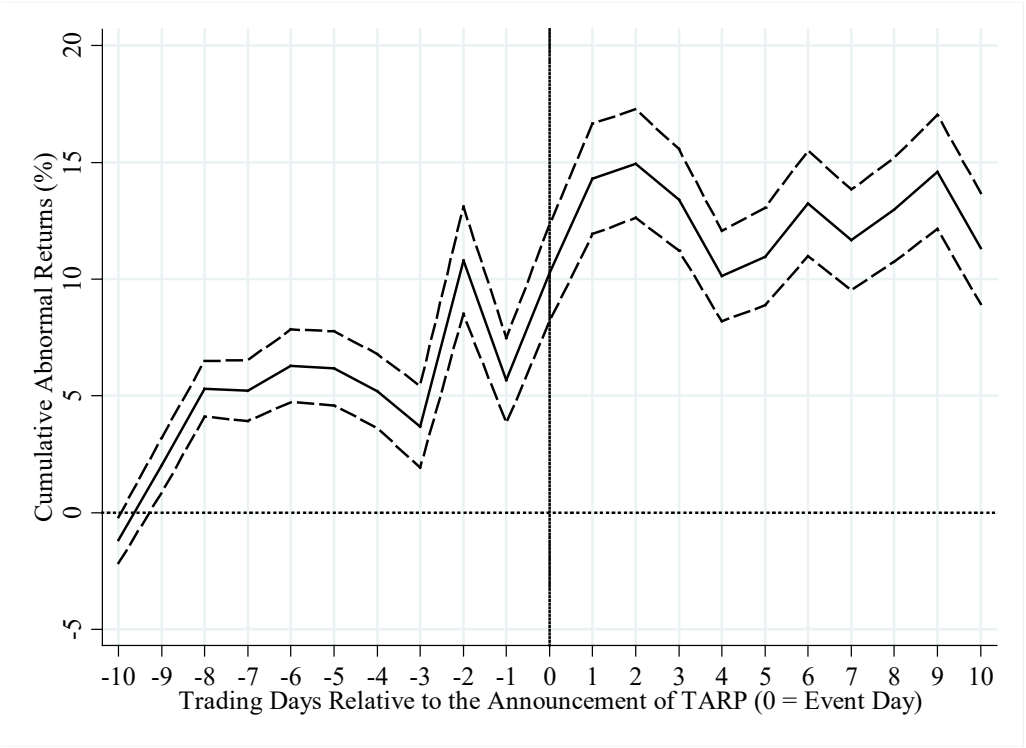
Table 7 shows the point and cumulative estimates of the average abnormal returns around the day of the announcement of TARP (i.e. October 14, 2008) estimated using one-factor market model. Figure 2 provides a graphical overview of the average CARs by plotting the average CARs against trading days relative to the day of the announcement of TARP along their 90% confidence bands. The point (daily average) and cumulative (relative to 10 days before the event) abnormal returns estimated using one-factor market model confirm the observation from Table 6. The average abnormal returns are significantly positive on the day of the announcement of TARP as well as the day after, both are greater than 4%, suggesting the event had an immediate effect on banks' stock performance. Even if we control for the pre-event trend (average daily abnormal return of 0.56% pre-event), the bailout banks' cumulative abnormal returns after the announcement of TARP are still significantly positive.

Table 7: Point and Cumulative Market Abnormal Returns Around the Announcement of TARP

Event Day	Point Estimation		CAR Estimation	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
–10	–1.1797**	0.5995	–1.1797**	0.5995
–9	3.2076***	0.4783	2.0279***	0.7144
–8	3.2726***	0.3762	5.3005***	0.7246
–7	–0.0726	0.3214	5.2278***	0.7879
–6	1.0556**	0.4689	6.2834***	0.9428
–5	–0.1050	0.3486	6.1784***	0.9646
–4	–0.9712**	0.4053	5.2072***	0.9615
–3	–1.5332***	0.4652	3.6740***	1.0621
–2	7.1279***	0.8051	10.8019***	1.3917
–1	–5.1411***	0.7728	5.6609***	1.1023
0	4.6041***	0.6944	10.2650***	1.2588
1	4.0336***	0.4975	14.2986***	1.4356
2	0.6496	0.4648	14.9482***	1.4079
3	–1.5513***	0.3725	13.3969***	1.3123
4	–3.2654***	0.3706	10.1315***	1.1757
5	0.8337**	0.3329	10.9652***	1.2634
6	2.2857***	0.3874	13.2509***	1.3685
7	–1.5725***	0.3873	11.6785***	1.3074
8	1.2891***	0.3207	12.9676***	1.3491
9	1.6307***	0.3458	14.5982***	1.4816
10	–3.2808***	0.4429	11.3175***	1.4425

*Notes: The table shows the point and cumulative abnormal returns estimated using Markowitz' market model in a window of ten days before and ten days after October 14, 2008 (the day of the announcement of TARP). The point and cumulative estimate of the average returns for the event are reported along their standard error. Standard errors are adjusted for heteroskedasticity and autocorrelation. The return variables are defined in the text. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

Figure 2: The Evolution of Market *CARs* Around the Announcement of TARP



Notes: The figure shows the average cumulative returns of the bailout banks in the sample in a window of ten days before and after October 14, 2008 (the day of the announcement of TARP), along their 90% confidence bands. CARs plotted in this figure are estimated using Markowitz market model.

Table 9 shows the point and cumulative estimates of the average abnormal returns around the day of the announcement of TARP estimated using Fama-French model. Figure 3 provides a graphical overview of the average CARs by plotting the average CARs against trading days relative to the day of the announcement of TARP (i.e. October 14, 2008) along their 90% confidence bands. The point and cumulative abnormal returns estimated using three-factor Fama-French model are more positive and more significant than their one-factor market model counterparts around the event window of 10 days before and after the announcement of TARP, confirming that the TARP to a great extent restored investors' confidence in financial system. The cumulative Fama-French abnormal return over the entire event window is as high as 21.95%. The difference between Figure 2 and Figure 3 may be explained by the size effect that large banks responded to the announcement of TARP more positively thank the small banks. To provide further insights, we split the bailout banks in our sample into 5 sub-samples based on their book value of assets as of the quarter-end of the announcement of TARP, i.e. 31 December, 2008. The cumulative abnormal return over the event window of 10 days before and after the event are reported for each of the 5 sub-samples, see Table 8 Panel A.

Table 8: Size-Group Summary Statistics for Cumulative Abnormal Returns Around the Announcement of TARP and the Receipt of TARP Funds

Panel A: Announcement Of TARP				
Total Assets	**Variable**	**Mean**	**Median**	**Std. Dev.**
≥ $10 billion	Market CARs	33.3835	28.2897	22.1362
	Fama-French CARs	44.0947	40.7852	23.4070
≤ $10 billion &	Market CARs	21.6413	21.3172	13.0647
≥ $3 billion	Fama-French CARs	45.2512	44.8689	18.1609
≤ $3 billion &	Market CARs	4.7970	5.5016	17.0882
≥ $1 billion	Fama-French CARs	17.9209	15.1201	25.7686
≤ $1 billion	Market CARs	–2.4887	–0.7948	15.0287
	Fama-French CARs	–1.5640	–0.6923	14.2551
Panel B: Receipt of TARP Funds				
Total Assets	**Variable**	**Mean**	**Median**	**Std. Dev.**
≥ $10 billion	Market CARs	–9.5270	–5.6087	20.0500
	Fama-French CARs	–1.4968	1.9461	18.4915
≤ $10 billion &	Market CARs	–9.9341	–9.1864	20.6067
≥ $3 billion	Fama-French CARs	–4.5483	–6.0440	20.2869
≤ $3 billion &	Market CARs	–5.6314	–5.7627	19.0473
≥ $1 billion	Fama-French CARs	–3.0392	–4.0684	19.5482
≤ $1 billion	Market CARs	5.3646	6.3623	21.0709
	Fama-French CARs	6.9637	7.1343	20.8991

Notes Panel A : Summary statistics are presented for the cumulative abnormal returns of the bailout banks in each of the sub-samples around October 14, 2008 (the day of the announcement of TARP). The sample of banks that accepted TARP bailout funds during this period is obtained from ProPublicas TARP database. Stock return data is retrieved from CRSP US Stock database. Following, FDIC and Federal Reserve Guidelines, the bailout banks in the sample are split into 4 subsamples based on their book value of total assets as of at the quarter-end of the announcement of TARP (December 31, 2008). Reported are mean, median, and standard deviations of market CARs, and Fama-French CARs in event windows of 10 trading days before and after the date that TARP was announced. The cumulative abnormal return variables are defined in the text. Notes Panel B: Of the sub-samples around the day that each bank in the sample actually received the TARP funds. This event date is specific to each bailout bank, ranging from October 2008 to December 2009. The sample of banks that accepted TARP bailout funds during this period is obtained from ProPublicas TARP database. Stock return data is retrieved from CRSP US Stock database. Following, FDIC and Federal Reserve Guidelines, the bailout banks in the sample are split into 4 sub-samples based on their book value of total assets as of at the end of the quarter that they received TARP funds. Reported are mean, median, and standard deviations of market CARs, and Fama-French CARs in event windows of 10 trading days before and after the date that TARP was announced. The cumulative abnormal return variables are defined in the text.

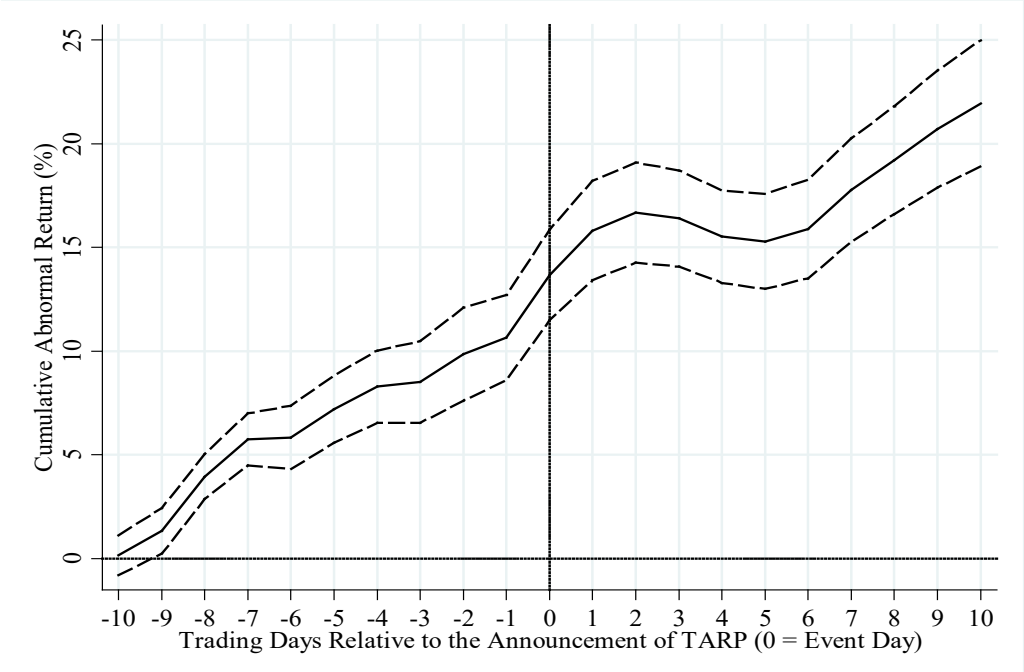
It clearly shows that the large banks were performing significantly better than the small banks when the TARP was announced. This difference may be because the large banks are more likely to be bailed out if it is needed in the future.

Table 9: Point and Cumulative Fama-French Abnormal Returns, Using the Market Model, around the Announcement of TARP

Event Day	Point Estimation		CAR Estimation	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
–10	0.1653	0.5822	0.1653	0.5822
–9	1.1677***	0.4582	1.3330**	0.6633
–8	2.6207***	0.3640	3.9537***	0.6573
–7	1.7938***	0.3458	5.7475***	0.7581
–6	0.0955	0.4566	5.8429***	0.9229
–5	1.3640***	0.3818	7.2069***	0.9809
–4	1.0793***	0.4109	8.2862***	1.0577
–3	0.2222	0.4738	8.5085***	1.1922
–2	1.3553**	0.6742	9.8637***	1.3584
–1	0.7876	0.6538	10.6513***	1.2451
0	3.0213***	0.6263	13.6727***	1.3190
1	2.1412***	0.4406	15.8139***	1.4506
2	0.8704**	0.4359	16.6843***	1.4585
3	–0.2849	0.3600	16.3994***	1.4062
4	–0.8778***	0.3328	15.5216***	1.3467
5	–0.2324	0.3210	15.2892***	1.3857
6	0.6062**	0.3574	15.8954***	1.4431
7	1.8690***	0.4024	17.7644***	1.5116
8	1.4465***	0.3216	19.2109***	1.5751
9	1.4977***	0.3391	20.7086***	1.7110
10	1.2408***	0.4435	21.9494***	1.8419

*Notes: The table shows the point and cumulative abnormal returns estimated using Fama-French three-factor model in a window of ten days before and ten days after October 14, 2008 (the day of the announcement of TARP). The point and cumulative estimate of the average returns for the event are reported along their standard error. Standard errors are adjusted for heteroskedasticity and autocorrelation. The return variables are defined in the text. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

Figure 3: The Evolution of Fama-French *Cars* Around the Announcement of TARP



Notes: The figure shows the average cumulative returns of the bailout banks in the sample in a window of ten days before and after October 14, 2008 (the day of the announcement of TARP), along their 90% confidence bands. CARs plotted in this figure are estimated using Fama-French three-factor model.

The Receipt of TARP Funds

Table 10 presents the mean, median and standard deviation of the same set of variables as defined in Table 6, but the event date is set to be the day that each bailout bank in our sample actually received the TARP funds, i.e. the day of receipt. The event date is chosen to be the date of receipt of the funds, as opposed to the mere announcement of that the bank will be receiving (or rejecting) the funds, as this is confirmation that the bank has accepted to receive the funds and the amount received is also quantifiable. As will be evident in the analysis in the tables below, the analysis considers different windows of 0, 1, 3, 5 and 10 days before and after the receipt date, as a way to check for consistency of results and eliminate the impact of other events such as stock-splits, management changes, corporate control related events. The results are generally consistent across the 5 observation windows. This establishes a pattern that has been reported in the literature (Bayazitova & Shivdasani, 2012).

Table 10: Returns Around the Receipt of TARP Funds

Event Window	Variable	Mean	Median	Standard Deviation
[–10, +10]	Raw stock returns	–0.2144	–0.1300	7.4602
	Market-adjusted	–0.1937	–0.2594	6.6341
	Fama-French adjusted	–0.0728	–0.1534	6.5758
	Market abnormal	–0.1862	–0.2798	6.6376
	Fama-French abnormal	0.0009	–0.0917	6.5784
	Market CARs	–3.9096	–3.6984	20.6118
	Fama-French CARs	0.0184	–1.2966	20.1531
[–5, +5]	Raw stock returns	–0.3758	–0.3596	7.7510
	Market-adjusted	–0.1881	–0.2196	7.0529
	Fama-French adjusted	0.0409	–0.0512	7.0174
	Market abnormal	–0.1805	–0.2220	7.0558
	Fama-French abnormal	0.1145	–0.0091	7.0200
	Market CARs	–1.9856	–2.4537	14.1084
	Fama-French CARs	1.2593	–0.9079	14.8878
[–3, +3]	Raw stock returns	–0.2312	–0.3223	7.7341
	Market-adjusted	–0.2338	–0.2337	7.0137
	Fama-French adjusted	–0.0617	–0.0964	7.0199
	Market abnormal	–0.2263	–0.2354	7.0153
	Fama-French abnormal	0.0118	–0.0525	7.0219
	Market CARs	–1.5838	–2.5484	14.4073
	Fama-French CARs	0.0826	–0.9841	14.4458
[–1, +1]	Raw stock returns	–0.3670	–0.5278	8.1077
	Market-adjusted	–0.4157	–0.2545	7.4903
	Fama-French adjusted	–0.1354	–0.1101	7.3808
	Market abnormal	–0.4082	–0.2121	7.4915
	Fama-French abnormal	–0.0619	–0.0382	7.3806
	Market CARs	–1.2245	–1.3223	10.9505
	Fama-French CARs	–0.1858	–0.1244	10.6885
[0]	Raw stock returns	0.9151	0.0000	8.5662
	Market-adjusted	–0.2565	–0.3593	8.1581
	Fama-French adjusted	0.0776	–0.2835	8.1485
	Market abnormal	–0.2489	–0.2121	8.1574
	Fama-French abnormal	0.1511	–0.2458	8.1434
	Market CARs	–0.2489	–0.2121	8.1574
	Fama-French CARs	0.1511	–0.2458	8.1434

Notes: Summary statistics are presented for the returns of the bailout banks around the day that each bank in the sample actually received the TARP funds. This event date is specific to each bailout bank, ranging from October 2008 to December 2009. The sample of banks that accepted TARP bailout funds during this period is obtained from ProPublica's TARP database. Stock return data is retrieved from CRSP US Stock database. Reported are mean, median, and standard deviations of Raw stock returns, market-adjusted stock returns, Fama-French adjusted returns, market abnormal returns, Fama-French abnormal returns, market CARs, and Fama-French CARs in event windows of 2T+1 trading days around the date that each bank received the TARP funds, i.e. 21 days, 11 days, 7 days, 3 days and 1 day around the day of receipt. The return variables are defined in the text.

In contrast to the results presented in Table 6, the bailout banks' stock returns around the day of the receipt of TARP funds are negative according to most of the measures, especially in the event window of 1 day before and after the event. However, the one-factor market model and three-factor Fama-French model give us conflicting results if alternative event windows are considered. Returns estimated using one-factor market model show a negative market reaction to the receipt of the bailout funds, while returns estimated using Fama-French three-factor model are all positive even though their magnitudes are fairly small (close to zero). The medians of the returns are consistently negative regardless of the model specification and event window considered. Our empirical results are consistent with the findings of Bayazitova and Shivdasani (2012) that the receipt of TARP funds did not have meaningful certification effect.

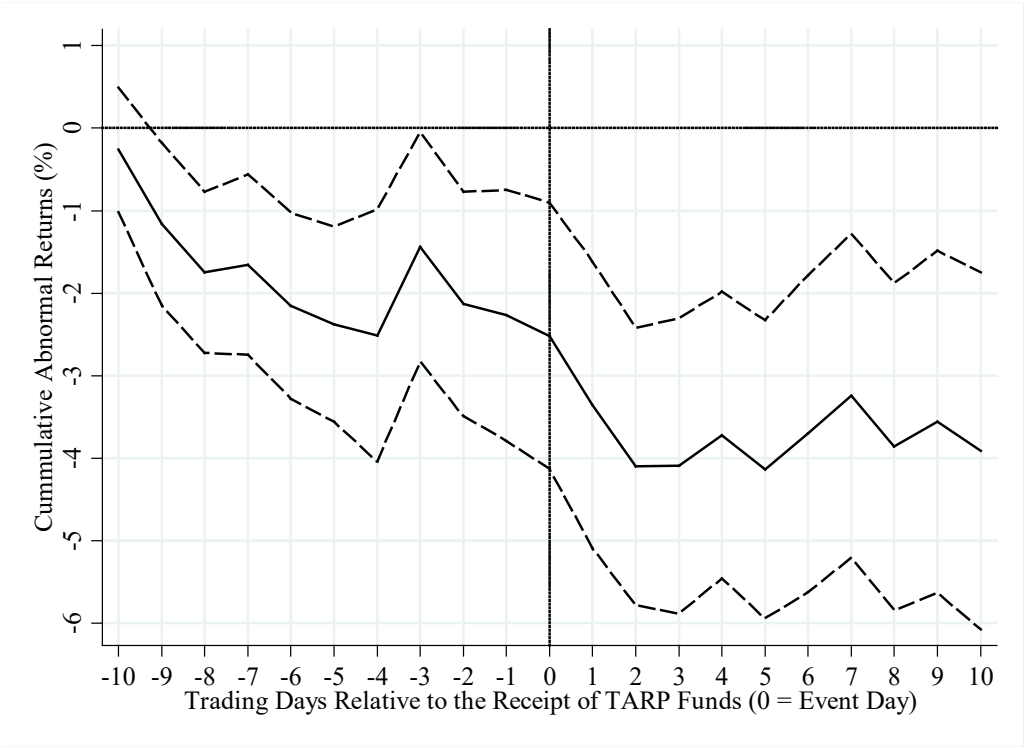
Table 11 reports the point and cumulative estimates of the average abnormal returns around the day of the receipt of TARP funds using market model. Figure 4 provides a graphical overview of the average CARs by plotting the dynamics of the average CARs against trading date relative to the day of the receipt of TARP funds along their 90% confidence bands. In line with the results reported in Table 10, the cumulative abnormal returns estimated using one-factor market model remain negative throughout the entire event window of 10 days before and after the banks actually received the bailout funds. The bailout bank experienced significantly negative abnormal returns immediately after the receipt of TARP funds. Although the bailout banks underperformed the market before they received the bailout funds, they performed even worse after the event. The negative cumulative abnormal returns are still significant even if we control for the pre-event downward trend. This may suggest that the receipt of TARP funds conveyed a signal that the bank is in trouble to the market, therefore the event was interpreted as bad news by the outside investors.

Table 11: Point and Cumulative Market Abnormal Returns Around the Receipt of TARP Funds

Event Day	Point Estimation		CAR Estimation	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
–10	–0.2615	0.4571	–0.2615	0.4571
–9	–0.9011**	0.4222	–1.1627*	0.5972
–8	–0.5859	0.3877	–1.7486***	0.5915
–7	0.0942	0.4259	–1.6544**	0.6610
–6	–0.4960	0.3999	–2.1504***	0.6831
–5	–0.2266	0.4051	–2.3771***	0.7165
–4	–0.1345	0.5779	–2.5116***	0.9269
–3	1.0749**	0.4933	–1.4367*	0.8428
–2	–0.6945**	0.3428	–2.1313**	0.8238
–1	–0.1377	0.4487	–2.2690**	0.9216
0	–0.2489	0.5190	–2.5179**	0.9776
1	–0.8379*	0.4600	–3.3557***	1.0529
2	–0.7471*	0.4066	–4.1028***	1.0186
3	0.0075	0.4248	–4.0954***	1.0850
4	0.3745	0.4150	–3.7208***	1.0519
5	–0.4153	0.3922	–4.1361***	1.0947
6	0.4329	0.3655	–3.7032***	1.1637
7	0.4601	0.3726	–3.2431***	1.1885
8	–0.6175*	0.3270	–3.8606***	1.2005
9	0.3006	0.3526	–3.5599***	1.2553
10	–0.3497	0.3794	–3.9096***	1.3115

*Notes: The table shows the point and cumulative abnormal returns estimated using Markowitz' market model in a window of ten days before and ten days after the day of the receipt of TARP funds (the event day is specific to each bailout bank). The point and cumulative estimate of the average returns for the event are reported along their standard error. Standard errors are adjusted for heteroskedasticity and autocorrelation. The return variables are defined in the text. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

Figure 4: The Evolution of Market *Cars* Around the Receipt of TARP Funds



Notes: The figure shows the average cumulative returns of the bailout banks in the sample in a window of ten days before and after the bailout banks in the sample received the TARP funds (this event day is specific to each bank), along their 90% confidence bands. CARs plotted in this figure are estimated using Markowitz' market model.

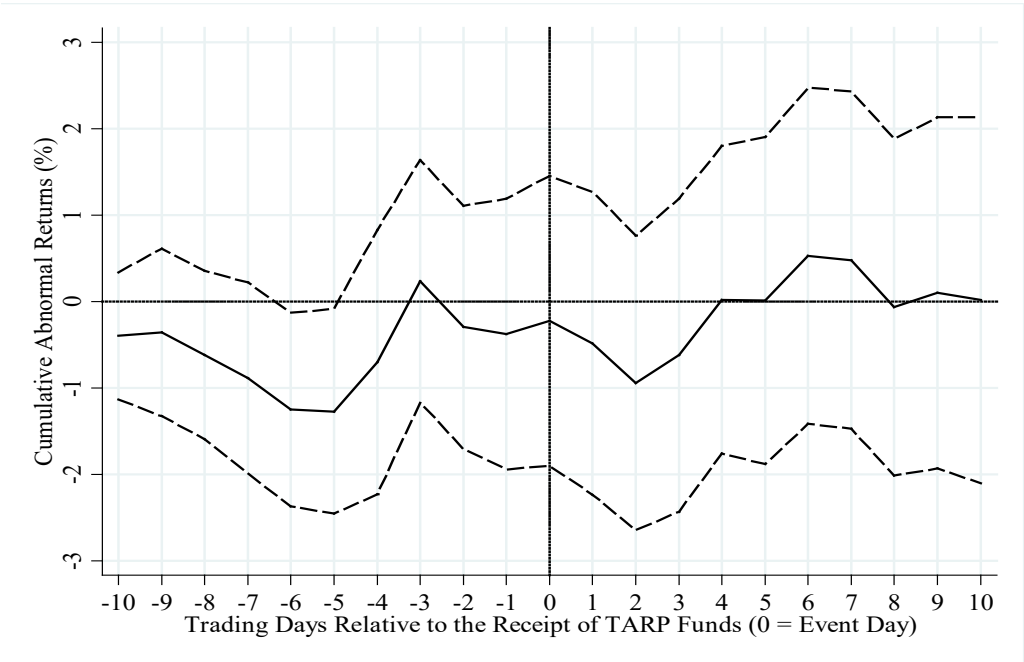
Table 12 shows the point and cumulative estimates of the average abnormal returns around the day of the receipt of TARP funds using Fama-French model. Figure 5 provides a graphical overview of the average CARs by plotting the average CARs against trading days relative to the day of the receipt of TARP funds along their 90% confidence bands. The point and cumulative abnormal returns estimated using Fama-French three-factor model show that the cumulative abnormal returns are not significantly different from zero during the period of 10 days before and after the banks received their bailout funds. Again, the difference between the three-factor Fama-French model results and the one-factor market model results may be caused by the size effect, which means the significantly negative abnormal return obtained using one-factor market model can largely be explained by the size factor included in the Fama-French three-factor model. To provide further evidence, we also report the sub-sample summary statistics for the cumulative abnormal returns for the 4 size groups as defined above, see Table 8 Panel B. It seems that on average the big banks' cumulative abnormal returns over the period of 10 trading days before and after the receipt of the TARP funds are more negative than that of small banks. The smallest banks with book value of total assets less than $1 billion experienced positive cumulative abnormal returns over the event window.

Table 12: Point and Cumulative Fama-French Abnormal Returns Around the Receipt of TARP Funds

Event Day	Point Estimation		Car Estimation	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
–10	–0.3969	0.4451	–0.3969	0.4451
–9	0.0411	0.4190	–0.3557	0.5870
–8	–0.2615	0.3935	–0.6172	0.5910
–7	–0.2675	0.4369	–0.8847	0.6699
–6	–0.3636	0.3910	–1.2482*	0.6799
–5	–0.0221	0.3972	–1.2703*	0.7174
–4	0.5682	0.5732	–0.7021	0.9268
–3	0.9399*	0.4942	0.2378	0.8496
–2	–0.5330	0.3580	–0.2953	0.8514
–1	–0.0795	0.4355	–0.3748	0.9487
0	0.1511	0.5182	–0.2237	1.0167
1	–0.2573	0.4526	–0.4810	1.0611
2	–0.4594	0.4127	–0.9404	1.0329
3	0.3209	0.4359	–0.6195	1.0976
4	0.6417	0.4183	0.0222	1.0777
5	–0.0112	0.3700	0.0110	1.1462
6	0.5199	0.3563	0.5310	1.1789
7	–0.0494	0.3671	0.4816	1.1827
8	–0.5459*	0.3094	–0.0643	1.1798
9	0.1660	0.3428	0.1016	1.2307
10	–0.0833	0.3723	0.0184	1.2823

*Notes: The table shows the point and cumulative abnormal returns estimated using Fama-French three-factor model in a window of ten days before and ten days after the day of the receipt of TARP funds (the event day is specific to each bailout bank). The point and cumulative estimate of the average returns for the event are reported along their standard error. Standard errors are adjusted for heteroskedasticity and autocorrelation. The return variables are defined in the text. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

Figure 5: The Evolution of Fama-French *CARs* Around the Receipt of TARP Funds



Notes: The figure shows the average cumulative returns of the bailout banks in the sample in a window ten days before and after the bailout banks in the sample received the TARP funds (this event day is specific to each bank), along their 90% confidence bands. CARs plotted in this figure are estimated using Fama-French three-factor model.

It is important check for the robustness of the results, by comparing the cumulative abnormal returns of the two groups of banks (treated and untreated), which are matched in terms of bank characteristics such as bank size, age, earnings, management quality, inter alia. This will establish the banks' reaction in each group by type of characteristics. This is the subject of the next section.

Counterfactual Analysis

We employ propensity score matching methods to check the robustness of our baseline results. We match bailout banks (treated) and non-bailout banks (untreated) on their financial variables (i.e. CAMELS variables) as well as demographic variables (i.e. bank size and age) as observed at the end of September 2008, the latest financial information available before the announcement of TARP. The matched bailout and their counterfactuals, i.e. non-bailout banks with similar background characteristics, are used to compare the performance in the event window of 3 days surrounding the receipt of TARP funds. The difference in performance between each bailout bank and its counterfactual is calculated. The average of the differences across all observations is the estimated average treatment effect on the treated (ATT). We use the nearest neighbor method to match bailout bank to their counterfactuals. More specifically, we assign each matched counterfactual (non-bailout bank) a (fake) event day which is identical to the day of its bailout counterpart received the TARP funds. We then estimate and compute the cumulative abnormal return of the counterfactual 3 days before and after its fake event day. The difference from the observed outcome, which in this case is the accumulative abnormal return in the event window, for the bailout banks and their counterfactuals is the average causal effect. The estimated results for the causal model with outcomes are reported in Table 13.

Table 13 presents the propensity score matching estimate of the average effect of the receipt of TARP funds on bailout banks. Panel A reports the estimated results for the logistic regression of receiving TARP funds on bank-level characteristics. The probability of receiving TARP funds is highly significantly related to a bank's capital adequacy. Banks with lower tier 1 capital to total risk-weighted assets ratio are more likely to receive bailout funds, suggesting that TARP mainly targets at low capital banks. Besides, earnings EAR is also an important determinant of the probability of receiving bailout funds which has p-value 0.14. Bank size SZ has p value 0.01. The other variables are statistically insignificant. The estimated logistic regression is then used to predict the propensity score, i.e. the probability of the receiving TARP funds for all the sample banks. According to the predicted propensity score, each bailout bank is matched to its "nearest neighbor" who did not actually receive bailout funds.

Panel B of Table 13 reports the estimated difference in balance of the bank characteristics variables before and after propensity score matching. Substantial decreases in means between bailout banks and their counterfactuals are observed in all the characteristics variables except management quality variables (*MQ*). The percentage reductions in imbalance due to matching for capital adequacy (*CA*) and earnings (*EAR*) are 91.70% and 90.10%, respectively. Panel C of Table 13 reports the propensity matching estimate of ATT, which in this case is the average effect of the receipt of TARP funds on bailout banks. The average cumulative abnormal return for the matched bailout banks in the event window of 3 days before and after the receipt of their TARP fund is -2.08%, while that for non-bailout banks is -0.03%. Therefore, average treatment effect on the treated is -2.05%. Since the propensity score estimate effectively controls the observed confounding variables, i.e. CAMELS variables, bank size and age, the estimated difference of -2.05% in performance between bailout banks and their counterfactuals can be reasonably interpreted as the effect of the acceptance of TARP funds on the bailout banks.

Table 13: Propensity Matching Estimate of the Effect of Receiving TARP Funds on the Bailout Banks

Panel A: Logistic Regression of Receiving TARP Funds on Bank Characteristics						
Variable	**Coefficient**	**Std. Dev.**	***z*-statistic**	***p*-value**	**95% Confidence interval**	
CA	–16.6126	6.3852	–2.60	0.01	–29.13	–4.10
AQ	13.9568	6.2954	2.22	0.03	1.62	26.30
MQ	0.0193	0.1666	0.12	0.91	–0.31	0.35
EAR	7.2442	4.9073	1.48	0.14	–2.37	16.86
LIQ	–3.3221	2.0722	–1.60	0.11	–7.38	0.74
SEN	–0.4131	1.1382	–0.36	0.72	–2.64	1.82
SZ	0.2619	0.1056	2.48	0.01	0.05	0.47
AGE	0.0094	0.0122	0.77	0.44	–0.01	0.03
Constant	–1.8016	1.7748	–1.02	0.31	–5.28	1.68
Panel B: Estimate Difference in Balance						
Variable	**Sample**	**Treated**	**Control**	**% bias**	**% reduce**	***t*-statistic**
CA	Unmatched	0.0990	0.1143	–26.70		–2.38
	Matched	0.0990	0.0977	2.20	91.70	0.60
AQ	Unmatched	–0.0202	–0.0274	28.40		2.52
	Matched	–0.0202	–0.0175	–10.50	63.00	–1.66
MQ	Unmatched	–0.4277	–0.4118	–2.10		–0.18
	Matched	–0.4277	–0.3522	–9.80	–374.40	–0.97
EAR	Unmatched	0.0000	–0.0076	22.00		1.96
	Matched	0.0000	–0.0007	2.20	90.10	0.38
LIQ	Unmatched	0.0405	0.0718	–14.60		–1.30
	Matched	0.0405	0.0362	2.00	86.20	0.93
SEN	Unmatched	0.1530	0.1351	15.90		1.40
	Matched	0.1530	0.1649	–10.60	33.00	–0.84
SZ	Unmatched	15.4600	14.6300	49.90		4.39
	Matched	15.4600	15.2390	13.30	73.40	1.15
AGE	Unmatched	24.0380	19.9800	31.80		2.80
	Matched	24.0380	22.3400	13.30	58.10	1.16
Panel C: Estimate of Average Effect of the Receipt of TARP Funds on Bailout Banks						
Variable	**Sample**	**Treated**	**Controls**	**Difference**	**S.E.**	***t*-statistic**
$CAR_{-10,\,10}$	ATT	–2.0761	–0.0303	–2.05	1.16	–1.77

Notes: The table reports propensity score matching estimate of the average effect of the receipt of TARP funds on the stock performance of the bailout banks. Panel A reports the estimation results for the logistic regression of a binary bailout variable (bank actually received TARP funds=1, and bank did not actually receive TARP funds=0) on bank characteristics. The estimated logistic regression is then used to predict each bank's propensity score, i.e. the probability of receiving TARP funds. According to the predicted propensity score, each bailout bank is matched to its "nearest neighbor" who did not actually receive bailout funds. Panel B assesses balance between treated and control groups. Reported are the estimated difference in means between bailout banks and non-bailout banks for bank characteristics variables before and after matching. A decrease in difference implies an increase in balance with respect to that covariate. Panel C reports the propensity matching estimate of the average effect of the receipt of TARP funds on the banks who actually received TARP funds. The outcome variable is defined as the cumulative abnormal return over the event window of 3 days before and after the receipt of TARP funds.

Robustness Checks

Our benchmark results (reported in Tables 6 and 9, parallel with Figures 2 and 4 respectively) show that abnormal returns were significantly positive around the announcement of TARP, while they were significantly negative around the receipt of TARP funds. A concern in any event study is that the findings are simply price momentum around the event dates. The price momentum around the event dates may either react pre-existing information flows or trading activities unrelated to the events. To check the robustness of our benchmark results, we test whether the abnormal returns are greater in the 3 days right after the events (i.e. day 0, day 1, and day 2) than in the average of the 10 days surrounding the events. The regression is specified as

$$\hat{\varepsilon}_{it} = \gamma_i + \gamma_{Dummy} Dummy3_t + \sigma_{it}, t \in [t^* - T, t^* + T] \quad (9)$$

where $\hat{\varepsilon}_{it}$ is the abnormal return for bank *i* on day *t* estimated using Markowitz' market model, γ_i is a bank-specific constant term, and $Dummy3_t$ is a dummy variable which is equal to 1 for the 3 days right after the event, and 0 otherwise. If the abnormal returns are greater in the 3 days right after the event, the coefficient

on the dummy variable γ_{Dummy} is expected to be statistically significant. Alternatively, we include a control that interacts the bailout size with a dummy that is equal to 1 for the 3 days right after the event and 0 otherwise. Thus, the interaction term is a variable that takes on the value of the amount of bailout received by a bank for the 3 days right after the event, and 0 otherwise. The alternative specification of the robustness test regression is specified as

$$\hat{\varepsilon}_{it} = \gamma_i + \gamma_{Interaction}(B_i \times Dummy3_t) + \sigma_{it}, t \in [t^* - T, t^* + T] \quad (10)$$

where B_i measures the amount of bailout funds that a bank accepted ($ billions). Equations (9) and (10) are estimated for both the announcement of TARP and the receipt of funds to check the robustness of our baseline results. The estimated coefficients of interest, i.e. γ_{Dummy} and $\gamma_{Interaction}$, are reported in Table 14. We also estimate Equations (9) and (10) using Fama-French abnormal returns as dependent variable for comparison purposes, testing Fama-French abnormal returns in the 3 days right after the event are significantly higher than the average over the entire event window. The results of the robustness check reported in Panel A clearly show that the abnormal returns are indeed significantly higher in the 3 days immediately after the announcement of TARP than the average of 10 days before and after the event, regardless of the specification of the test. The interaction term that interacts with the dummy variable with the bailout size is also significantly positive. It should be noted that the amount of bailout funds received by the banks was not known at the time when TARP was announced. The significantly positive coefficient on the interaction term may imply that the abnormal returns immediately after the announcement of TARP are higher for the banks that were expected to receive more bailout funds in the future. Hence, the results presented in Panel A confirm that the announcement of TARP indeed had a positive effect on the performance of banks who received TARP funds later on.

Table 14: Abnormal Returns Immediate After TARP Events

Dependent Variable	Coefficient	Estimate	Standard Deviation
Panel A: Announcement of TARP			
Market abnormal return	γ_{Dummy}	2.9830***	0.3209
	$\gamma_{Interaction}$	0.3445***	0.0895
Fama-French abnormal return	γ_{Dummy}	1.1267***	0.2828
	$\gamma_{Interaction}$	0.1577***	0.0538
Panel B: Receipt of TARP Funds			
Market abnormal return	γ_{Dummy}	–0.4960**	0.2408
	$\gamma_{Interaction}$	–0.2230***	0.0616
Fama-French abnormal return	γ_{Dummy}	–0.2210	0.2710
	$\gamma_{Interaction}$	–0.1431***	0.0516

*Notes: The robustness tests check whether the abnormal returns are greater in the 3 days right after the event than in the average over the entire event window under consideration. The robustness tests are specified as $\hat{\varepsilon}_{it} = \gamma_i + \gamma_{Dummy} Dummy3_t + \sigma_{it}$ (Equation (9)) where $Dummy3_t$ is a dummy variable which is equal to 1 for the 3 days right after the event, and 0 otherwise. Alternatively, we interact the dummy with the amount of bailout funds received by a bank (US dollar in billions), and estimate $\hat{\varepsilon}_{it} = \gamma_i + \gamma_{Interaction}(B_i \times Dummy3_t) + \sigma_{it}$ (Equation (10)), where the interaction term takes on the value of the amount of bailout received by a bank for the 3 days right after the event, and 0 otherwise. If the abnormal returns are greater in the 3 days right after the event than the average over the entire window, the coefficients on the dummy variable γ_{Dummy} and the interaction term $\gamma_{Interaction}$ are expected to be statistically significant. Reported are estimated coefficients of interest, i.e. γ_{Dummy} and $\gamma_{Interaction}$, along their standard error. Standard errors are adjusted for heteroskedasticity and autocorrelation. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

The results based on the abnormal return estimated using market model in Panel B show that, even if we take the price momentum around the receipt date into account, the stock price declines of the banks are still significant for the 3 days immediately after they received TARP funds. The negative abnormal stock returns are even more statistically significant for the banks that received larger amount of TARP funds. However, the abnormal returns estimated using the Fama-French model are not significantly greater in the 3 days right after the banks received bailout funds, even though on average the Fama-French abnormal returns are lower in the 3-day window. Once we interact the dummy with the bailout size, the coefficient becomes

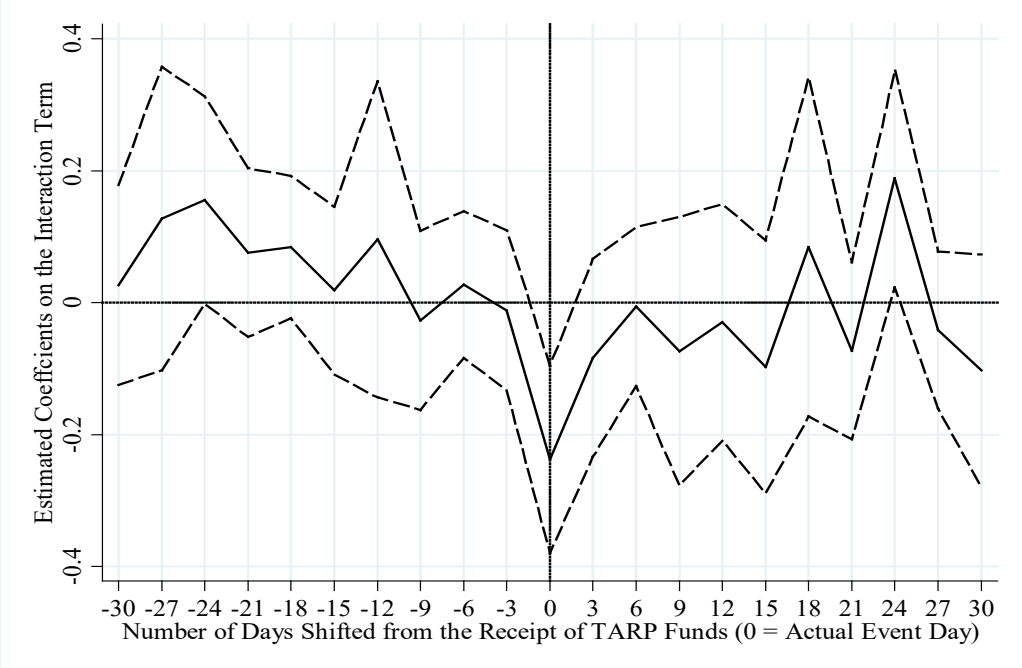
highly significant, confirming that the market interprets the receipt of TARP funds as bad news, and thus penalizes the recipients of TARP funds, especially those who received large amounts.

As additional evidence that our results are not an artifact of the data, we re-estimate Equation (10) on a set of placebo dates. We shift the 3-day window forwards as well as backwards by 3*S* days, i.e. 3, 6, 9, 12, 15, 18, 21, 24, 27, and 30 days. For each 3*S* day shift, we estimate

$$\hat{\varepsilon}_{it} = \gamma_i + \gamma_{Interaction3S}(B_i \times Dummy3_{t+3S}) + \sigma_{it}, S = 0,1,2,3,\ldots,10 \quad (11)$$

We graph our estimates of the coefficient on the interaction term against the number of days shifted from the actual receipt of TARP funds in Figure 6. The thick line plotted in Figure 6 indicates the estimated coefficients for a regression of daily abnormal returns estimated using Markowitz' market model on an indicator for placebo receipt date interacted with the size of TARP funds received by the bailout banks. Out of the 21 time-shifted regressions, $\gamma_{Interaction3S}$, is only significantly negative at 1% significance level for $S = 0$, which is identical to the actual receipt date. The estimated coefficients using the other 20 placebo dates are all smaller in absolute value and statistically less significant. The estimate is also significant at the 1% significance level for $S = 8$, i.e. shifting the event day forward by 24 days, but with positive sign. The placebo estimates reinforce that there were sizable negative abnormal returns just after the receipt of TARP funds, and the decline in bailout banks' stock prices was caused by the acceptance of TARP funds.

Figure 6: Time-Shifted Placebos



Notes: The time-shifted placebos test whether the results are an artifact of the data, by re-estimating Equation (3) days right after the event interacted on a set of placebo dates. We shift the 3-day window forwards as well as backward by 3S days, i.e. 3, 6, 9, 12, 15, 18, 21, 24, 27, and 30 days. For each 3S day shift, we estimate $\hat{\varepsilon}_{it} = \gamma_i + \gamma_{Interaction3S}(B_i \times Dummy3_{t+3S}) + \sigma_{it}$, *where* $S = 0,1,2,3,\ldots,10$ *(Equation (11)). The solid line plots the estimated coefficients on the interaction term (*$\gamma_{Interaction3S}$*). The horizontal axis labels denote the number of days by which we shift the receipt of TARP. The dashed lines represent the 99% confidence intervals using standard errors that are adjusted for heteroskedasticity and autocorrelation.*

Note that this robustness test is not applicable to the announcement of TARP, because in that case the event date is common to all the banks. Even if the time-shifted regression is estimated, the coefficient of interest ($\gamma_{Interaction3S}$) is still highly likely to be statistically significant since the interaction term may capture

either size effect (large amount of bailout funds are expected to committed to larger banks, and thus positively correlated) or other market factors that affect sample banks' abnormal returns systematically on the placebo dates.

CONCLUDING COMMENTS

In the face of the worst global financial shock in a century, the US government launched a number of bailout plans to fix the financial system, but none has proven to be as controversial as the Troubled Assets Relief Program, or TARP, which authorized the US Treasury to make injections of capital into banks, as well as unlimited deposit insurance (for non-interest-bearing accounts), and guarantees of new senior debt. TARP, was highly unpopular with the public, a punching bag for congressional opponents and baggage for its supporters, even as new data indicated the program would cost a small fraction of its original price tag. This article is to our knowledge the first to examine how the market responsed to the launch of TARP and the receipt of bailout funds as reflected in stock returns. More prominently, we allow for non-random selection into the TARP bailout program by using propensity score matching methods. This strategy permits a counterfactual interpretation of the data and provides the first credible empirical evidence to answer the research question "what would have happened to those banks that did in fact receive bailout funds if they had not received the bailout". The empirical evidence presented in this article shows favorable market response to the announcement of TARP, which suggests that the launch of the bailout program indeed helped restore investors' confidence in the financial system. However, the market seemed to react negatively to the receipt of TARP bailout funds. The stock price decreased more for banks being given greater bailouts. Thus, receiving bailouts generated an adverse market signal, instead of ensuring certification. In a future article, Ncube and Hausken (2019) consider TARP bailout size, buy and hold returns, and tail risk.

APPENDICES

Appendix 1: History of US Government Bailouts

Year	Target	Event	Size
1970	Penn Central Railroad	In May 1970, Penn Central Railroad, then on the verge of bankruptcy, appealed to the Federal Reserve for aid on the grounds that it provided crucial national defense transportation services. The Nixon administration and the Federal Reserve supported providing financial assistance to Penn Central, but Congress refused to adopt the measure. Penn Central declared bankruptcy on June 21, 1970, which freed the corporation from its commercial paper obligations. To counteract the devastating ripple effects to the money market, the Federal Reserve Board told commercial banks it would provide the reserves needed to allow them to meet the credit needs of their customers.	$3.2 billion
1971	Lockheed	In August 1971, Congress passed the Emergency Loan Guarantee Act, which could provide funds to any major business enterprise in crisis. Lockheed was the first recipient. Its failure would have meant significant job loss in California, a loss to the GNP and an impact on national defense.	$1.4 billion
1974	Franklin National Bank	In the first five months of 1974, Franklin National Bank lost $63.6 million. The Federal Reserve stepped in with a loan of $1.75 billion.	$7.8 billion
1975	New York City	During the 1970s, New York City became over-extended and entered a period of financial crisis. In 1975 President Ford signed the New York City Seasonal Financing Act, which released $2.3 billion in loans to the city.	$9.4 billion
1980	Chrysler	In 1979 Chrysler suffered a loss of $1.1 billion. That year the corporation requested aid from the government. In 1980 the Chrysler Loan Guarantee Act was passed, which provided $1.5 billion in loans to rescue Chrysler from insolvency.	$4.0 billion

Appendix 2: History of US Government Bailouts (Continued)

Year	Target	Event	Size
1984	Continental Illinois National Bank and Trust Company	Then the nation's eighth largest bank, Continental Illinois had suffered significant losses after purchasing $1 billion in energy loans from the failed Penn Square Bank of Oklahoma. The FDIC and Federal Reserve devised a plan to rescue the bank that included replacing the bank's top executives.	$9.5 billion
1989	Savings & Loan	After the widespread failure of savings and loan institutions, President George H.W. Bush signed and Congress enacted the Financial Institutions Reform Recovery and Enforcement Act in 1989.	$293.3 billion
2001	Airline Industry	The terrorist attacks of September 11 crippled an already financially troubled industry. To bail out the airlines, President George W. Bush signed into law the Air Transportation Safety and Stabilization Act, which compensated airlines for the mandatory grounding of aircraft after the attacks. The act released $5 billion in compensation and an additional $10 billion in loan guarantees or other federal credit instruments.	$18.6 billion
2008	Bear Stearns	JP Morgan Chase and the federal government bailed out Bear Stearns when the financial giant neared collapse. JP Morgan purchased Bear Stearns for $236 million; the Federal Reserve provided a $30 billion credit line to ensure the sale could move forward.	$30 billion
2008	Fannie Mae / Freddie Mac	On September 7, 2008, Fannie and Freddie were essentially nationalized: placed under the conservatorship of the Federal Housing Finance Agency. Under the terms of the rescue, the Treasury has invested billions to cover the companies' losses. Initially, Treasury Secretary Henry Paulson put a ceiling of $100 billion for investments in each company. In February 2009, Tim Geithner raised it to $200 billion. The money was authorized by the Housing and Economic Recovery Act of 2008.	$400 billion
2008	American International Group	On four separate occasions, the government offered aid to AIG to keep it from collapsing, rising from an initial $85 billion credit line from the Federal Reserve to a combined $180 billion effort between the Treasury ($70 billion) and Fed ($110 billion). $40 billion of the Treasury's commitment is also included in the TARP total.	$180 billion
2008	Auto Industry	In late September 2008, Congress approved a more than $630 billion spending bill, which included a measure for $25 billion in loans to the auto industry. These low-interest loans are intended to aid the industry in its push to build more fuel-efficient, environmentally-friendly vehicles. The Detroit 3, i.e. General Motors, Ford and Chrysler, were the primary beneficiaries.	$25 billion
2008	Troubled Asset Relief Program	In October 2008, Congress passed the Emergency Economic Stabilization Act, which authorized the Treasury Department to spend $700 billion to combat the financial crisis. Treasury doled out the money via an alphabet soup of different programs.	$700 billion
2008	Citigroup	Citigroup received a $25 billion investment through the TARP in October and another $20 billion in November. Additional aid came in the form of government guarantees to limit losses from a $301 billion pool of toxic assets. In addition to the Treasury's $5 billion commitment, the FDIC has committed $10 billion and the Federal Reserve up to about $220 billion.	$280 billion
2009	Bank of America	Bank of America received $45 billion through the TARP, which includes $10 billion originally meant for Merrill Lynch. In addition, the government has made guarantees to limit losses from a $118 billion pool of troubled assets. In addition to the Treasury's $7.5 billion commitment, the FDIC has committed $2.5 billion and the Federal Reserve up to $87.2 billion.	$142.2 billion

Notes: Adopted from ProPublica website http://www.propublica.org/special/government-bailouts#tarp. The relative size of each US government bailout is calculated in 2008 dollars.

Appendix 3: Summary Statistics for the Four Size Groups

Variable	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	No. of Obs.
Panel A: Total Assets ≥ $10 billion						
BA	4.94	0.33	1.49	3.50	7.7040	42
BR	29.88%	24.54%	30.55%	34.05%	0.1154	42
CA	9.20%	8.15%	8.88%	9.43%	0.0167	42
AQ	2.28%	1.40%	2.03%	3.03%	0.0118	42
MQ	63.81%	53.63%	62.47%	69.90%	0.1445	42
EAR	0.12%	–0.14%	0.26%	0.71%	0.0121	42
LIQ	7.79%	2.72%	3.81%	5.18%	0.1262	42
SEN	21.59%	13.88%	23.94%	29.07%	0.1085	42
SZ	18.15	16.60	17.98	18.98	1.7415	42
AGE	33.81	22.00	34.00	40.00	22.3893	42
Panel B: $10 billion ≥ Total Assets ≥ $3 billion						
BA	0.13	0.08	0.10	0.15	0.0538	37
BR	29.00%	26.45%	30.10%	32.15%	0.0598	37
CA	9.79%	9.23%	9.75%	10.13%	0.0092	37
AQ	1.82%	0.85%	1.54%	2.24%	0.0130	37
MQ	79.95%	59.39%	65.45%	75.42%	0.4899	37
EAR	–0.58%	–0.10%	0.60%	0.88%	0.0328	37
LIQ	3.07%	2.13%	2.91%	3.45%	0.0136	37
SEN	16.01%	8.46%	16.53%	24.16%	0.0970	37
SZ	15.47	15.17	15.42	15.86	0.3845	37
AGE	22.22	15.00	25.00	26.00	8.2568	37
Panel C: $3 billion ≥ Total Assets ≥ $1 billion						
BA	0.04	0.03	0.04	0.05	0.0483	70
BR	29.41%	23.12%	28.60%	31.41%	0.2298	70
CA	10.32%	9.34%	10.17%	11.10%	0.0162	70
AQ	1.89%	1.00%	1.38%	2.19%	0.0167	70
MQ	62.52%	59.29%	66.35%	72.17%	0.2852	70
EAR	0.19%	0.07%	0.47%	0.71%	0.0111	70
LIQ	3.06%	2.36%	2.82%	3.42%	0.0139	70
SEN	12.29%	4.73%	9.37%	17.48%	0.0984	70
SZ	14.36	14.11	14.31	14.62	0.3126	70
AGE	18.66	10.00	20.50	25.00	10.8252	70
Panel D: $1 billion ≥ Total Assets						
BA	0.02	0.01	0.02	0.02	0.0119	36
BR	28.93%	25.39%	27.51%	31.06%	0.1347	36
CA	10.61%	9.38%	10.40%	11.12%	0.0168	36
AQ	1.64%	0.83%	1.59%	2.12%	0.0113	36
MQ	70.29%	64.86%	70.39%	76.41%	0.0856	36
EAR	–0.02%	0.16%	0.45%	0.77%	0.0160	36
LIQ	3.36%	2.46%	2.95%	3.57%	0.0211	36
SEN	13.70%	4.92%	11.28%	20.81%	0.1133	36
SZ	13.52	13.37	13.50	13.73	0.2211	36
AGE	12.92	7.00	12.50	16.50	7.6695	36

Notes: The table reports the summary statistics of the main variables used in the study. Reported are the mean, 25th percentile, median, 75th percentile, and standard deviation of each variable listed in Table II. The statistics for the financial variables are computed based on the Bank Holding Company Data released at the end of September 2008, the latest financial information available before the announcement of TARP on October 14, 2008. BA represents bailout amount (in billions $), BR bailout ratio, CA capital adequacy, AQ asset quality, MQ management quality, EAR earnings, LIQ liquidity, SEN sensitivity, SZ bank size (natural log of total assets in thousands $), and AGE bank age (number of years). The detailed definition and data source are available in Table 2.

REFERENCES

Abadie, A., Angrist, J., & Imbens, G. (2002). "Instrumental Variables Estimates of the Effect of Subsidized Training on the Quantiles of Trainee Earnings," Econometrica, vol. 70(1), p. 91-117. doi:10.1111/1468-0262.00270

Adrian, T., & Brunnermeier, M. K. (2016). "CoVaR," American Economic Review, vol. 106(7), p. 1705-1741. doi:10.1257/aer.20120555

Aït-Sahalia, Y., Andritzky, J., Jobst, A., Nowak, S., & Tamirisa, N. (2012). "Market Response to Policy Initiatives During the Global Financial Crisis," Journal of International Economics, vol. 87(1), p. 162-177. doi:10.1016/j.jinteco.2011.12.001

Angrist, J. D. (2004). "Treatment Effect Heterogeneity in Theory and Practice," Economic Journal, vol. 114(494), p. C52-C83.

Angrist, J. D., Imbens, G. W., & Rubin, D. B. (1996). "Identification of Causal Effects Using Instrumental Variables," Journal of the American Statistical Association, vol. 91(434), p. 444-455. doi:10.1080/01621459.1996.10476902

Bayazitova, D., & Shivdasani, A. (2012). "Assessing TARP," Review of Financial Studies, vol. 25(2), p. 377-407. doi:10.1093/rfs/hhr121

Bebchuk, L. A. (2009). "Buying Troubled Assets," Yale Journal on Regulation, vol. 26(2), p. 343-358.

Beck, T. (2014). "Finance, Growth, and Stability: Lessons From the Crisis," Journal of Financial Stability, vol. 10, p. 1-6. doi:10.1016/j.jfs.2013.12.006

Berger, C., Black, L., Bouwman, K., & Dlugosz, J. (2017). "Bank Loan Supply Responses to Federal Reserve Emergency Liquidity Facilities," Journal of Financial Intermediation, vol. 32, p. 1-15.

Blinder, A. S., & Zandl, M. (2010). How the Great Recession Was Brought to an End. http://www.economy.com/mark-zandi/documents/End-of-Great-Recession.pdf.

Cadman, B., Carter, M. E., & Lynch, L. J. (2012). "Executive Compensation Restrictions: Do They Restrict Firms' Willingness to Participate in TARP?," Journal of Business Finance & Accounting, vol. 39(7-8), p. 997-1027. doi:10.1111/j.1468-5957.2012.02307.x

Calomiris, C. W., & Khan, U. (2015). "An Assessment of TARP Assistance to Financial Institutions," Journal of Economic Perspectives, vol. 29(2), p. 53-80. doi:10.1257/jep.29.2.53

Coates, J., & Scharfstein, D. (2009). "Lowering the Cost of Bank Recapitalization," Yale Journal on Regulation, vol. 26(2), p. 373-389.

Cornett, M. M., Li, L., & Tehranian, H. (2012). "The Performance of Banks Around the Receipt and Repayment of Tarp Funds: Over-Achievers Versus Under-Achievers," Journal of Banking and Finance, vol. 37(3), p. 730-746. doi:10.1016/j.jbankfin.2012.10.012

De Graeve, F., & Karas, A. (2014). "Evaluating Theories of Bank Runs With Heterogeneity Restrictions," Journal of the European Economic Association, vol. 12(4), p. 969-996. doi:10.1111/jeea.12080

Diamond, D. W., & Dybvig, P. H. (1983). "Bank Runs, Deposit Insurance, and Liquidity," Journal of Political Economy, vol. 91(3), p. 401-419. doi:10.1086/261155

Ding, C. G., Wu, C.-H., & Chang, P.-L. (2013). "The Influence of Government Intervention on the Trajectory of Bank Performance During the Global Financial Crisis: A Comparative Study Among Asian Economies," Journal of Financial Stability, vol. 9(4), p. 556-564. doi:10.1016/j.jfs.2012.11.002

Duchin, R., & Sosyura, D. (2012). "The Politics of Government Investment," Journal of Financial Economics, vol. 106(1), p. 24-48. doi:10.1016/j.jfineco.2012.04.009

Heckman, J. (1990). "Varieties of Selection Bias," American Economic Review, vol. 80(2), p. 313-318.

Heckman, J. J. (1979). "Sample Selection Bias as a Specification Error," Econometrica, vol. 47(1), p. 153-161. doi:10.2307/1912352

Holland, P. W. (1986). "Statistics and Causal Inference," Journal of the American Statistical Association, vol. 81(396), p. 945-960. doi:10.1080/01621459.1986.10478354

Hu, G. X., Pan, J., & Wang, J. (2013). "Noise as Information for Illiquidity," Journal of Finance, vol. 68(6), p. 2341-2382. doi:10.1111/jofi.12083

Isidore, C. (2014). "U.S. Ends Tarp With $15.3 Billion Profit." CNN Money, December 19, 2014. Retrieved from http://money.cnn.com/2014/12/19/news/companies/government-bailouts-end/

Ivashina, V., & Scharfstein, D. (2010). "Bank Lending During the Financial Crisis of 2008," Journal of Financial Economics, vol. 97(3), p. 319-338. doi:10.1016/j.jfineco.2009.12.001

Kolari, J. W., & Pynnönen, S. (2010). "Event Study Testing with Cross-sectional Correlation of Abnormal Returns," The Review of Financial Studies, vol. 23(11), p. 3996-4025.

La Monica, P. R. (2009). "Hooray for Banks That Refused Bailouts!." CNN Money, September 11, 2009. Retrieved from http://money.cnn.com/2009/09/11/markets/thebuzz/index.htm?postversion=2009091121

Li, L. (2013). "Tarp Funds Distribution and Bank Loan Supply," Journal of Banking and Finance, vol. 37(12), p. 4777-4792. doi:10.1016/j.jbankfin.2013.08.009

Mishkin, F. S. (2017). "Rethinking Monetary Policy After the Crisis," Journal of International Money and Finance, vol. 73, p. 252-274. doi:10.1016/j.jimonfin.2017.02.007

Ncube, M. and Hausken, K. (2019), "Evidence on the Troubled Assets Relief Program, Bailout Size, Returns and Tail Risk," International Journal of Business and Finance Research, vol. 13(2), p. 1-20.

Samuelson, R. J. (2011). "'TARP's Success Story'." Washington Post, March 28, 2011.

Taliaferro, R. (2009). "How Do Banks Use Bailout Money? Optimal Capital Structure, New Equity, and the TARP.," http://ssrn.com/abstract=1481256.

Taylor, J. B. (2009). Getting Off Track : How Government Actions and Interventions Caused, Prolonged, and Worsened the Financial Crisis (Vol. no. 570). Stanford, California: Hoover Institution Press.

Veronesi, P., & Zingales, L. (2010). "Paulson's Gift," Journal of Financial Economics, vol. 97(3), p. 339-368. doi:https://doi.org/10.1016/j.jfineco.2010.03.011

Wilson, L., & Wu, Y. W. (2012). "Escaping TARP," Journal of Financial Stability, vol. 8(1), p. 32-42. doi:10.1016/j.jfs.2011.02.002

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CAN THE OPEN MARKET REACT TO STOCK REPURCHASES ANNOUNCEMENT CORRECTLY?

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ABSTRACT

In this study, we explore the market reaction to the announcement of stock repurchase plans, and the mutual influence between the actual fulfillment rate of stock repurchase plans and the degree of earnings management. From the perspective of earnings management behavior, this paper also analyzes the actual fulfillment rate, and discusses the information asymmetry, firms may carry out earnings management before stock repurchases, to mislead the investors into believing the prettified financial statements, to induce the investors to invest, and convey false signals to the market. The empirical results demonstrate that the cumulative abnormal return (CAR) resulting from true signals is higher than that resulting from false signals. Further, the phenomenon is more significant in the hi-tech industry than in traditional industries, and the firms with Purpose 3(support the stock prices to maintain firm credit and shareholders' equity), a significant, positive abnormal return is observed on the day before and the day after the announcement day. In bullish periods, abnormal returns are not significant; in bearish periods, a significant, positive abnormal return is observed. These findings are applicable not only to the research samples but also to the samples when the extreme values are removed. Therefore, the empirical results are still robust.

JEL: G32, G34, G41

KEYWORDS: Stock Repurchases, Abnormal Returns, Earnings Management

INTRODUCTION

On October 19th, 1987, the Dow Jones Industrial Average (DJIA) index experienced a sharp drop within six hours, with an estimated loss of 22% of the market value of stocks. In the subsequent several days, at least 900 publicly listed firms announced their stock repurchase plans (Kracher et al., 1997). As a result, the situation was reversed within a short period. The stock market embraced the quick rebound, and the DJIA index regained a bullish trend. Due to this event, the treasury stock system rose to fame. In 2000, Taiwan revised the related law to adopt the treasury stock system, thus providing a legal basis for the suspended treasury stock system. Specifically, the treasury stock system granted publicly listed firms the permission to repurchase their stocks in the public stock market. From then on, the treasury stock system has become a hot issue of research. This study explores the market reaction to the announcement of stock repurchase plans, and the mutual influence between actual fulfillment rate and earnings management. In light of the signal hypothesis, this paper also discusses whether the cumulative abnormal return (*CAR*) arising from the true signals is higher than the *CAR* arising from the false ones. Previous studies show that the announcement of stock repurchase plans will result in a positive abnormal return. There exist diverse views in the previous literature regarding this return. In the general literature, there exist a variety of hypotheses regarding the purposes of stock repurchases. For example, improving the return on equity, distributing the surplus capital, forestalling hostile takeover, adjusting the leverage ratio to the desired level, attaining managerial entrenchment, substituting the payment of cash dividends, depriving the creditors of their wealth, and conveying specific signals.

Signals, conveying certain signals is considered as the main motive of the announcement of stock repurchases. As set forth in the early literature, the announcement of stock repurchase plans will result in a positive abnormal return, indicating that the firms' stock prices are underestimated (Vermaelen, 1981; Netter and Mitchell, 1989; Comment and Jarrell, 1991; Raad and Wu, 1995; Ikenberry, Lakonishok and Vermaelen, 1995; Liu and Ziebart, 1997; Nohel and Tarhan, 1998; Dittmar, 2000). In case the firms' stock prices have a great slump but are unlikely to rally subsequently, however, the firms may actively implement stock repurchase plans by spreading false information, to boost their stock prices. Sometimes, investors are misled in stock markets, or specifically, firms announce their stock repurchase plans in public but in essence, carry out earnings management. Therefore, investors must give careful consideration when making decisions, and observe whether firms intend to cover up their earnings management decisions by announcing stock repurchase plans. Therefore, investors should stay away from firms with high discretionary accruals when they make decisions.

Oriented toward the announcement of stock repurchase plans by firms, this study distinguishes the degree of their earnings management before their announcement of stock repurchases, analyzes the actual stock repurchase rate, and thus discusses whether the abnormal return is different between the firms with a varying degree of earnings management. Further, this study analyzes whether the *CAR* of firms with a high degree of earnings management is different from that of firms with a low degree of earnings management, and judges, whether the signals conveyed by the firms,a are true or false. According to the observation of all samples, when firms carry out negative earnings management on the announcement day, a positive and significant abnormal return is produced. Evidently, the market reaction to the true signals is more significant than that of the false signals if firms carry out negative earnings management before the announcement of stock repurchase plans. In the circumstances where firms convey true signals (earnings management is of low degree and negative, and the actual stock repurchase rate is very high), the market reaction to the true signals is not more significant than that of the false signals (specifically, earnings management is of high degree and positive, and the actual stock repurchase rate is very low). In other words, this effect has not been observed. In the circumstances where firms convey true signals (earnings management is of low degree and positive, and the actual stock repurchase rate is very high), the market reaction to true signals is a little more significant than that of the false signals (specifically, earnings management is of high degree and negative, and the actual stock repurchase rate is very low). When earnings management is positive, the market reaction to the true signals is not more significant than that of the false signals. Judging by the absolute values of earnings management, the market reaction to the true signals, represented by a low degree of earnings management and high actual fulfillment rate, is not more significant than that of the false signals, represented by a high degree of earnings management and low actual stock repurchase rate.

Furthermore, this study explores in depth whether the market reaction to the true signals is more significant than that of the false signals in different circumstances. In the case where the entire sample is used, the market reaction to the true signals is more significant than that of the false signals. After the top 1% and bottom 1% extreme values are removed from the sample, the market reaction to the true signals is more significant than that of the false signals. Besides, the present study finds that in bullish periods, the market reaction to the true signals is not more significant than that of the false signals, whereas in bearish periods, the market reaction to the true signals is more significant than that of the false signals. For hi-tech firms, the market reaction to the true signals is more significant than that of the false signals; for traditional firms, the market reaction to the true signals is also more significant than that of the false signals. Firms repurchase their stocks outstanding for three purposes. Specifically, Purpose 1 is to transfer shares to their employees; Purpose 2 is to facilitate the issue of warrant bonds, preferred shares with warrants, convertible bonds, convertible preferred stocks, or stock warrants, thus satisfying the need to transfer shares; Purpose 3 is to maintain firm credit and shareholders' equity, and cancel the related shares.

Purpose 2 only involves 6 observations, so this study only uses Purposes 1 and 3 for sample classification. For the firms with Purpose 1, the market reaction to true signals is not more significant than that to false signals; for the firms with Purpose 3, the market reaction to true signals is more significant than that to

false signals. Therefore, the present study finds that the market reaction to true signals is more significant than that to false signals. This paper comprises a total of five sections. Section 1, describes the motives and purposes of the present study. Section 2, gives a review of the previous literature on market reaction to stock repurchases and announcement of stock repurchases, stock price reactions to actual fulfillment rate and announcement of stock repurchases, investment signals conveyed by stock repurchases, and earnings management. Section 3, describes the research hypotheses, regression model and methodology. Section 4, analyzes empirical results and discussion. Section 5, summarizes the study conclusions, and points out the limitations of this study and the suggestions for futher research.

LITERATURE REVIEW

Oriented to the firms that announce stock repurchase plans, the present study is intended to analyze whether such firms have any signs of earnings manipulation, and discuss the correlation between actual stock repurchase rate, earnings management, and abnormal returns.

The Motivation and Purposes of Share Repurchases

Regarding the motives and purposes of stock repurchases, there mainly exist the following views in the early research literature: 1) Firms may improve the return on equity; when the financing costs of debts are low and corporate operating profits are high, firms can repurchase their stocks for use as treasury stocks through debt finance; this results in a decrease in shareholders' equity and an increase in the return on equity. 2) Firms may return capital to the shareholders through stock repurchases instead of the payment of cash dividends; this results in a reduction in the shareholders' tax burden without any dilution of value per-share, and also an adjustment of capital structure (Dittmar, 2000; Grullon and Ikenberry, 2000). 3) Firms prefer to return the surplus capital to the investors by implementing stock repurchase plans, to maintain the value of stock options held by them and prevent the earnings per share from being diluted by the stock options (Dittmar, 2000). 4) Firms may convey the signals of their promising prospect and future cash flows (Vermaelen, 1981). 5) Firms may carry out managerial entrenchment and suppress free cash flows, to reduce the principal-agent problems (Jensen, 1986; Grullon and Ikenberry, 2000).

The Market Reaction to the Announcement of Stock Repurchase Plans and Earnings Management

The market reaction to the announcement of stock repurchases is mainly influenced by the insider ownership ratio, purposes of stock repurchases, and book-to-market ratio. According to the research on the long-term performance of an announcement of stock repurchases in open markets, Ikenberry, Lakonishok, and Vermaelen (1995) find that firms choose to repurchase their stocks because they consider their stocks undervalued by markets, and after the announcement of stock repurchases, their stock prices are influenced positively, and a significant abnormal return is produced. In their research, firms are classified by the book-to-market ratio. The research results show that the firms with a high book-to-market ratio are undervalued the most significantly; in other words, a significant abnormal return is produced when the firms with value-oriented stocks announce their stock repurchase plans. According to the empirical results, the following can be inferred: The firms with a high book-to-market ratio are very likely to convince the markets that their stock prices are underestimated; when such firms announce their stock repurchase plans, the investors are likely to believe the firm managers' statements, thus purchasing their stocks. Chou and Lin (2003) study the possibility that false signals are conveyed when firms announce their stock repurchase plans in open markets. Research results show that external professionals do not regard stock repurchases as a piece of good news; firm managers can manipulate financial statements to improve the earnings performance and adjust the discretionary accruals to convince outsiders that the firm equity is undervalued. Research results also show that stock analysts do not regard the announcement of stock repurchases as a positive signal, so they give a downward rather than upward revision of the earnings forecast. Also, small negative surprise revisions are found in the earnings forecasts of the stock analysts. In other words, firms may convey false information to market participants by repurchasing their stocks in open markets, to emphasizing that their firm equity is underestimated.

Chou and Lin (2003) discuss the false signals conveyed by the announcement of stock repurchases and conduct empirical research from the perspective of earnings management and analysts' revisions of financial forecasts. Research results show that firms will resort to the weakest signal mechanism, namely, repurchase their stocks in an open market to convey false information to market, to emphasizing that their firm equity is undervalued. However, does the announcement of stock repurchases by firms only convey false signals? This study aims to determine the actual fulfillment rate after the announcement of stock repurchases. Therefore, this study uses the actual fulfillment rate to verify whether firms have really fulfilled their stock repurchase plans, and explores the following two issues: 1) whether the firms announcing stock repurchase plans display any behavior of manipulating the earnings management, and 2) whether the cumulative abnormal return (*CAR*) of the firms conveying true signals is significantly higher than the *CAR* of the firms conveying false signals. Therefore, in the case of information asymmetry, firms may carry out earnings management before stock repurchases, to mislead the investors into believing the prettified financial statements, induce the investors to invest, and convey false signals to the market.

If investors have rational expectations and the actual fulfillment rate is very high, this indicates that the firms are indeed releasing positive information to boost their underestimated stock prices; then, their stock prices will produce an abnormal return (Stephens and Weisbach, 1998). As compared to the firms that have not fulfilled their stock repurchase plans substantially, the stock prices of firms with an actual fulfillment rate of 30% or above will produce a significant and positive abnormal return in the long term (Ikenberry, Lakonishok, and Vermaelen, 2000). Firms may have fulfilled their stock repurchase plans, but the actual number of repurchased stocks is smaller than the announced number of stocks to be repurchased; this is mainly due to the rise in stock prices, thus making stock repurchases less attractive than expected; however, the actual number of repurchased stocks will increase in the case of a fall in stock prices (Baker et al., 2003). This type of stock transactions is consistent with the signal hypothesis. Therefore, an investment portfolio with a high actual fulfillment rate reacts to the conveyed information ahead of the investment portfolio with a low actual fulfillment rate. This implies that the actual fulfillment rate of stocks used as treasury stocks will influence the degree of investors' attention.

The Influence on Stock Prices Exerted by the Stock Repurchase Plans and Earnings Management

Regarding the influence on stock prices exerted by the announcement of stock repurchase plans by firms, there exists a high degree of consensus in the previous research literature. Specifically, upon the announcement of stock repurchase plans by firms, their stock prices will embrace an immediate short-term rise; this indeed represents a piece of good news to the investors. The extent of the rise in stock prices may be influenced significantly by a variety of variables. For the firms listed in NYSE, the *CAR* arising from the announcement of stock repurchase plans has a significantly positive correlation with the market value of treasury stocks (Tsetsekos, 1993), announced repurchase rate (Raad and Wu 1995; Liu and Ziebart, 1997), operating revenue (Bartov, 1991; Dann et al. 1991; Tsetsekos, 1993), benefit-cost ratio (Rozeff and Zaman, 1988), and shareholding ratio by internal shareholders (Penman, 1982; Netter and Mitchell 1989; Raad and Wu 1995). In contrast, the *CAR* arising from the announcement of stock repurchase plans has a significant negative correlation with the risk or Beta value (Dann et al., 1991; Bartov, 1991; Tsetsekos, 1993; Choi and Chen, 1997), debt ratio (Wansley et al., 1989; Bartov, 1991; Tsetsekos, 1993), firm size (Rozeff and Zaman, 1988, Tsetsekos 1993; Liu and Ziebart, 1997), and bid-ask spread (Wiggins, 1994). Fama (1970) argues that a market is efficient if security prices fully reflect the available information in the market. At this time, investors cannot capitalize on any trading strategy to earn an excess return. Research results show that a significant and positive abnormal return is produced before and after firms announce their stock repurchase plans (Vermaelen, 1981; Netter and Mitchell, 1989; Comment and Jarrell, 1991; Raad and Wu, 1995; Ikenberry, Lakonishok, and Vermaelen, 1995; Liu and Ziebart, 1997; Nohel and Tarhan, 1998; Dittmar, 2000).

This paper discusses whether the stock prices of firms produce a significant abnormal return before and after the firms announce their stock repurchase plans. Bhattacharya (1979), Miller and Rock (1985), and Vermaelen (1984) argue that there exists an information asymmetry between firm managers and investors.

Firm managers know more about the firm's prospects and real firm value than the outside investors, so firm managers can repurchase stocks in an open market to convey the promising prospects to the markets, thus leading market to purchase their stocks; when firms carry out stock repurchase plans, market investors will reevaluate the firms, thus resulting in positive market reaction toward the firms' future performance. After firms announce their stock repurchase plans, their stock prices will produce a significant and positive abnormal return; therefore, it is inferred that investors may regard the announcement of stock repurchases as a signal of promising firm prospect, and believe that the firms' value is underestimated (Vermaelen, 1981; Dann, 1981; Dittmar, 2000). Empirical results show that the stock prices of firms may experience an abnormal drop in market crash periods before the announcement of stock repurchases and rebound in a certain period after the announcement of stock repurchases (Netter and Mitchell, 1989). The research results demonstrate that the announcement of stock repurchase plans exerts a positive influence on stock markets. In other words, the announcement of stock repurchases is regarded as a signal that the insiders of firms consider their stock prices to be underestimated. Previous literature mostly focuses on the market reaction (for example, abnormal return from stock prices and earnings management) to the announcement of stock repurchase plans, but rarely touches on the market reaction to the true or false signals conveyed by the announcement of stock repurchases. Because of this, this paper gives a further discussion of this topic.

RESEARCH HYPOTHESIS AND METHODOLOGY

Research Hypothesis

By announcing their stock repurchase plans, firms may convey two types of signals to markets: 1) true signals (firm value is underestimated), which will lead the markets to revalue their stocks; 2) false signals (firm managers announce stock repurchase plans for their own benefits, but the stock repurchase plans are not necessarily fulfilled), which may misadvise the investment decisions of the investors. Because of this, it is of vital importance to distinguish the true from the false signals conveyed by the announcement of stock repurchase plans; the investors need to have great ability to discriminate true signals from false ones. This paper discusses whether true or false signals are conveyed to the markets when firms announce their stock repurchase plans. When the degree of earnings management is above the average level, and the actual stock repurchase rate is above the average level, this indicates that true signals are conveyed to the market. When the degree of earnings management is above the average level while the actual stock repurchase rate is below the average level, this indicates that false signals are conveyed to the market.

Ikenberry et al. (1995) argue that there exists a market under-reaction to open market share repurchases. However, firm managers convey false signals to markets if firm equity is not undervalued, namely, there exists any market under-reaction to the announcement of stock repurchase plans. This paper assumes that firm managers will manipulate an upward revision of discretionary accruals to cover up the fact of no undervaluation, thus convincing the investors that firm equity is underestimated. The efficient market hypothesis is discussed in this paper: If all investors are rational and acquire the ability to analyze financial reports, firm managers will decrease the manipulations of earnings management to win the investors' trust; then, firm managers will try to convey signals that various types of information are reflected in stock prices effectively. Using event study methodology, this study checks how new information is incorporated into stock prices; the intent is to evaluate whether the abnormal return of firms with a below-average degree of earnings management and an above-average actual fulfillment rate is higher than the abnormal return of firms with earnings management behaviors and a low actual fulfillment rate. Therefore, this paper proposes the following hypothesis:

Hypothesis When firms announce their stock repurchase plans, the cumulative abnormal return (*CAR*) arising from the true signals is higher than that arising from the false signals.

Empirical Regression Model

This paper discusses whether the earnings management behaviors of firms will influence their announcement of stock repurchase plans. The market reaction (represented by an abnormal return) to the announcement of stock repurchase plans varies with the degree of earnings management and actual fulfillment rate. Therefore, this paper introduces a dummy variable representing true or false signals to discuss the influence on abnormal returns exerted by the announcement of stock repurchase plans. The main regression model is expressed as follows:

$$CAR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where, $CAR(\tau_1, \tau_2)$ indicates the cumulative abnormal return (CAR) in the event window(τ_1, τ_2) regarding the i-th stock to be repurchased. $SIGNAL_{i,t}$ is the dummy variable representing true or false signals. $SIZE_{i,t}$ indicates the firm size (the natural logarithm of the market value of firm equity). $BM_{i,t}$ indicates the book-to-market ratio. $IOR_{i,t}$ indicates the insider ownership ratio. $IPR_{i,t}$ indicates the insider pledge ratio. $GRW_{i,t}$ indicates the sales growth rate. $CAP_{i,t}$ indicates the capital expenditure ratio. $DER_{i,t}$ indicates the ratio of debt to equity. $CDY_{i,t}$ indicates the cash dividend yield. $DevA_{i,t}$ indicates the deviation between voting rights and cash distribution right, and $DevB_{i,t}$ indicates the deviation between director right and cash distribution right. Table 1 shows the definition of variables.

Research Sample and Data

From the perspective of earnings management behaviors, this study investigates 664 of Taiwan's publicly listed firms that announced stock repurchase plans during the period of Quarter 3 of 2008 to Quarter 2 of 2016. The criteria for sample selection are as follows: 1) The selected sample excludes the firms that announce stock repurchase plans repeatedly in the same year, but only includes the firms that announce stock repurchase plans for the first time, thus preventing biased errors in the research results. 2) The stocks available from the TEJ (Taiwan Economic Journal) with data omissions are excluded. 3) Full-cash delivery stocks are excluded; certain stocks are not full-cash delivery stocks when they are repurchased for use as treasury stocks, but are categorized as full-cash delivery stocks subsequently. To prevent the abnormal fluctuation in stock prices due to the changes in stock categorization and trading methods, full-cash delivery stocks are excluded; the quantity and transaction amount of full-cash delivery stocks account for a small proportion of all traded stocks, so they do not produce a significant influence. 4) Due to the special nature of the banking and securities industry, the firms in this industry are excluded. 5) The other industries that possess unique industrial characteristics or comprise very few firms are also excluded. 6) For a few industries, the number of observed values is not sufficient, thus affecting the reliability of the regression estimation. Therefore, such industries are consolidated to satisfy the needs of estimation of non-discretionary accruals. The financial data of the sampled firms are available from the TEJ database. The data about the conditions for stock repurchases is available from the Market Observation Post System of the Taiwan Stock Exchange. Using the method proposed by Kothari et al. (2005), Table 2 shows the consolidated industries, to introduce the cross-section data about the industries of same categories in the same year to the regression model, to estimate the discretionary accruals. However, a few Taiwanese industries comprise very few firms; therefore, the related industries are consolidated to overcome the insufficiency in the number of observed values.

Table 1: Definition of Variables

Variable Category	Definition of Variable
Dependent Variable	*CAR*(Cumulative Abnormal Return) $AR_{i,t} = R_{i,t} - E(\widehat{R_{i,t}})$, the $i-$ th stock to be repurchased, abnormal returns (2) $CAR_i = \sum AR_{i,t}$, the $i-$ th stock to be repurchased, cumulative abnormal returns (3)
Independent Variables	a) *DA*(Discretionary Accruals): using the methods proposed by Kothari, Leone, and Wasley (2005) and set forth in most of the research literature, this study uses *DA* (discretionary accruals) as the proxy variable to measure the degree of accrual earnings management, and measure the space of the administering authority's earnings management allowed by certified accountants (DeFond and Jiambalvo, 1994; Jones, 1991; Becker, DeFond, Jiambalvo, and Subramanyam, 1998; Subramanyam, 1996; Francis and Schipper, 1999). Using the method proposed by Kothari et al. (2005), this study introduces the cross-sectional data regarding the industries of the same category and year into the regression model, to estimate $DA_{i,t}$.. The measurement method is expressed as follows: $\frac{TA_{i,t}}{A_{i,t-1}} = \delta_0 + \delta_1\left[\frac{1}{A_{i,t-1}}\right] + \delta_2\left[\frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}}\right] + \delta_3\left[\frac{PPE_{i,t}}{A_{i,t-1}}\right] + \delta_4 ROA_{i,t-1} + \varepsilon_{i,t}$ (4) Where, $TA_{i,t}$indicates the total accruals, which are equal to the pretax earnings of the continuous operating activities minus the cash flow from operating activities. $A_{i,t-1}$indicates the total assets in early stage. ΔREV indicates the changes in sales revenue. ΔREC indicates the changes in accounts receivable. PPE indicates the total depreciable fixed assets (including housing and buildings, costs of machines, instruments and devices, costs of other devices, value added from revaluation of fixed assets, and value added from land revaluation), and $ROA_{i,t-1}$indicates the return on total assets in early stage, and $\varepsilon_{i,t}$ indicates the residual term. $\frac{NDA_{i,t}}{A_{i,t-1}} = \hat{\delta}_0 + \hat{\delta}_1\left[\frac{1}{A_{i,t-1}}\right] + \hat{\delta}_2\left[\frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}}\right] + \hat{\delta}_3\left[\frac{PPE_{i,t}}{A_{i,t-1}}\right] + \hat{\delta}_4 ROA_{i,t-1}$ (5) $\frac{DA_{i,t}}{A_{i,t-1}} = \frac{TA_{i,t}}{A_{i,t-1}} - \frac{NDA_{i,t}}{A_{i,t-1}}$ (6) Where $NDA_{i,t}$indicates the non-discretionary accruals. Finally, $DA_{i,t}$can be determined as the difference between actual total accruals $(TA_{i,t})$and estimated non-discretionary accruals $(NDA_{i,t})$ b) *SIGNAL* is a dummy variable, it indicates whether the conveyed signals are true or false. The actual fulfillment rate and discretionary accruals $(DA_{i,t})$ are used as the criteria for judging true or false signals. A high actual fulfillment rate and low discretionary accruals indicate that true signals are conveyed to market; a low actual fulfillment rate and high discretionary accruals indicate that false signals are conveyed to market. *SIGNAL* indicates true signals if its value is 1, and false signals if its value is 0. It cannot be judged whether true or false signals are conveyed in the following two circumstances: 1) The degree of earnings management and actual fulfillment rate are both above their average levels. 2) The degree of earnings management and actual fulfillment rate are both below their average levels. Therefore, observations that fit these two circumstances are excluded from this study. c) Actual Repurchase Rate: this paper uses the data available from the Market Observation Post System. The actual fulfillment rate is equal to the ratio of the current number of repurchased stocks to the predetermined number of repurchased stocks, and the actual repurchase rate is averaged among all the observations, for use as the criterion for judging the final actual fulfillment rate. If firm size and book-to-market ratio are held constant, the announcement of stock repurchase plans will result in an excess return in the long term; this is mainly due to discretionary accruals (Ikenberry et al., 1995).
Firm Characteristic Variables	a) *SIZE* (Firm Size) = The natural logarithm of the market value of firm equity = *ln(Size)* b) *BM* (Book-to-Market Ratio) = The ratio of equity net worth to equity market value
Insider Trading Variables	a) Insider Ownership Ratio (*IOR*) = (Number of stocks held by insiders) ÷ (Number of outstanding stocks) b) Insider Equity Pledge Ratio (*IPR*) = (Number of stocks pledged by insiders) ÷ (Number of stocks held by insiders)
Accounting Information Variables	a) *GRW* (Revenue Growth Rate) = (Net operating revenue of the year) ÷ (Net operating revenue of the second year) – 1 b) *CAP* (Expense to Capital Ratio) = (Average annual expense in the previous two years) ÷ (Market value of firm equity in the previous one year) c) Debt to Equity Ratio (*DER*) = (Total debt) ÷ (Market value of equity) d) Cash Dividend Yield (*CDY*) = (Cash dividends) ÷ (Market value of equity)
Corporate Governance Variables	a) *DevA* (Deviation between voting right and cash distribution right) = (Control voting right ratio) – (Cash distribution right) b) *DevB* (Deviation between director seat right and cash distribution right) = (Control director seat right ratio) – (Cash distribution right)

This table shows the definition of variable

Table 2：Categories of Consolidated Industries

Category of Consolidated Industries	Industry Categories in Taiwan Stock Exchange
Construction & Building Materials	Cement Industry, Iron & Steel Industry, Building Materials & Construction
Food & Department Store	Food Industry, Department Store Industry
Plastics & Chemicals	Plastics Industry, Chemical, Biotech & Pharmacy Industry, Rubber Industry
Textiles	Textile Fiber Industry
Electro-Mechanics	Electro-Mechanics Industry, Electrical Appliance & Cable Industry
Electronics	Electronics Industry (excluded TDR)

This table using the method proposed by Kothari et al. (2005), this study introduces the cross-section data on the industries of same categories in the year for the regression model, to estimate the discretionary accruals. However, a few industries of Taiwan each comprise very few firms; therefore, the related industries are consolidated to overcome the insufficiency in the number of observed values.

Table 3 lists the number of observations in each industry, total number of observations, and statistics based on the purposes of stock repurchases.

Descriptive Statistical Analysis

As described in Table 4, it shows that the firms have a slightly negative average *CAR* before they carry out stock repurchase plans, and have a positive average *CAR* during the period of fulfilling the stock repurchase plans, among the total 664 observations, the average *CAR* is 0.19 on the announcement day (*CAR*(0, 0)), and is 1.48 from the day before the announcement day to the day after the announcement day (*CAR*(-1, 1)). Evidently, their underestimated stock prices rise gradually. This proves that the fulfillment of stock repurchase plans indeed serves to boost the underestimated stock prices.

Table 3: Statistics of Share Repurchases

Total number of eligible firms in the related industries	287 firms
Total number of observations of share repurchases	664 events
Number of Observations in Each Industry (in Descending Order)	
Electronics Industry (excluding TDR)	189 firms
Textile Fiber Industry	21 firms
Building Materials & Construction Industry	15 firms
Iron & Steel Industry	13 firms
Chemical, Biotech & Pharmacy Industry	13 firms
Electro-Mechanics Industry	12 firms
Trade & Department Store Industry	8 firms
Electrical Appliance & Cable Industry	5 firms
Plastics Industry	4 firms
Cement Industry	3 firms
Rubber Industry	3 firms
Food Industry	1 firm
Statistics Based on the Purposes of Stock Repurchases	
Purpose 1: Transfer shares to employees	322 observations
Purpose 2: Transfer of shareowners	6 observations
Purpose 3: Maintain firm credit and shareholders' equity	336 observations
Number of firms with expiration, completion, or termination of stock repurchase plans	664 firms

The research period is from Q3 of 2008 to Q2 of 2016, and the financial data of the sampled firms are available from the TEJ database. The data about the conditions for stock repurchases are available from the Market Observation Post System of Taiwan Stock Exchange.

EMPIRICAL RESULTS AND DISCUSSION

Based on the research hypothesis and methodology in previous section, this section gives an empirical analysis and makes an inference from the empirical results. Section 1 conducts a statistical analysis for the degree of earnings management made by the firms announcing their stock repurchase plans and describes the distribution of the observations in the related industries. Section 2 verifies the short-term effect of the announcement of stock repurchase plans according to the degree of earnings management. Section 3 conducts a regression analysis.

Sample Structure of Share Repurchases Announced

The research sample consists of Taiwanese publicly listed firms that announced their stock repurchase plans in Taiwan's open stock market. Through sample screening, there are 287 eligible firms. Among these, there are 31 firms in the construction & building materials industry (accounting for 10.8% of the total), and 9 firms in the food & department store industry (accounting for 3%). There are 20 firms in the plastics & chemicals industry (accounting for 7%), and 21 firms in the textile industry (accounting for 7.3%). There are 17 firms in the electromechanical industry (accounting for 6%), and 189 firms in the electronics industry (accounting for 65.9%, the highest proportion).

Descriptive Statistics on Discretionary Accruals (*DA*)

Using the method proposed by Kothari et al. (2005), Table 4 lists the results of the descriptive statistical analysis, to introduce cross-sectional data on the industries of the same categories and year to the regression model, to estimate the discretionary accruals. The sampled firms that manipulate earnings management before the announcement of stock repurchase plans can be divided into two types: 1) firms with positive discretionary accruals, and 2) firms with negative discretionary accruals. Table 5 describes the distribution of the sampled firms in the different industries. Among the 664 sampled firms, there are 308 sampled firms with positive earnings management before stock repurchases and 356 sampled firms with negative earnings management before stock repurchases.

Effect of the Announcement of Stock Repurchase Plans

The setting of time parameters Using the market model of event study methodology, this study measures the abnormal return after stock repurchases and distinguishes the sampled firms into two types, one with positive discretionary accrual and another one with negative discretionary accrual. Then, this study observes the *CAR* of the two types of firms after the announcement of stock repurchase plans. The related time parameters are defined as follows: 1) Event day: The day on which firms announce their stock repurchase plans (t = 0). 2) Estimation period: A total of 121 days, starting from the 150th day before the event day to the 30th day before the event day (t = –150 to –30). 3)Event window: A total of 7 days, starting from the 1st day before the event day to the 5th day after the event day (t = –1 to +5).

Difference in the Effect of the Announcement of Stock Repurchase Plans

In the present study, the *CAR* on the event day is displayed through an event window. Tables 6 and 7 describe the analysis results on the earnings management behavior before the announcement of stock repurchase plans. In Table 6, Panel A lists the absolute values of earnings management regarding 664 firms that announced stock repurchase plans. Among the 664 firms, 227 firms convey true signals and 118 firms convey false signals. During the period from the day before the event day to the day after the event day (the event window is (-1, +1)), the abnormal return of the firms with a high degree of earnings management and high actual fulfillment rate is higher than the abnormal return of the firms with a high degree of earnings management and low actual fulfillment rate. The result of a t-test indicates statistical significance at the 10% level. It shows that the market reaction to the true signals is more significant than

that of the false signals. In Table 6, Panel B lists the data on the upward revision of the earnings forecast regarding the 664 firms that announced stock repurchase plans. Among these firms, 105 firms convey true signals and 56 firms convey false signals. During the period from the day before the event day to the day after the event day

Table 4: Descriptive Statistical Analysis Results

All Samples (N = 664)				
Variables	**Mean**	**STD Error**	**Min.**	**Max.**
CAR(0,0)	0.19	1.63	-6.31	15.1
CAR(-1,1)	1.48	2.71	-7.77	11.5
SIGNAL	0.66	0.48	0	1
Ln(Size)	15.4	1.29	12.4	21.2
BM	1.48	0.80	0.10	5.02
IOR	36.9	14.3	7.01	91.6
IPR	18.4	29.3	0	193
GRW	1.92	51.4	-89.6	682
CAP	-0.07	0.11	-0.95	0
DER	1.58	2.93	0.01	43.0
CDY	3.83	3.58	0	25.4
DevA	5.40	8.52	0	44.6
DevB	34.9	21.8	-34.1	92.1
DA	-0.003	0.062	0.471	-0.280

The regression model is $CAR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; Dependent variable CAR presents cumulative abnormal return, CAR(0,0) is average CAR on the announcement day of share repurchases, CAR(-1,1) presents average CAR from previous one day to next one day of the announcement day. The dummy variable SIGNAL indicates whether the conveyed signals are true or false. SIGNAL indicates true signals if its value is 1 and false signals if its value is 0. Ln(Size) is firm size taken the logarithm. BM is the book-to-market ratio. IOR is insider ownership ratio. IPR is insider pledge ratio. GRW is revenue growth rate. CAP is expense to capital ratio. DER is debt to equity ratio. CDY is cash dividend yield. DevA is deviation between voting right and cash distribution right. DevB is deviation between director right and cash distribution right. DA is discretionary accruals, as the proxy variable to measure the degree of accrual earnings management, and measure the space of the administering authority's earnings management allowed by certified accountants.*

Table 5: Distribution of the Firms with Earnings Management in Different Industries

Industry	**Positive Discretionary Accruals (Ratio, %)**	**Negative Discretionary Accruals (Ratio, %)**
Construction & Building Materials	38 (12.3)	25 (7.02)
Food & Department Store	11 (3.57)	6 (1.68)
Plastics & Chemicals	26 (8.44)	18 (5.06)
Textiles	20 (6.49)	18 (5.06)
Electrical & Mechanics	23 (7.47)	20 (5.62)
Electronics	190 (61.7)	269 (75.6)
Total Samples	308 (100.0)	356 (100.0)

The numerical values contained in brackets indicate the proportion of sampled industry in total samples.

(the event window is (-1, +1)), the abnormal return of the firms with a high degree of earnings management and high actual fulfillment rate is higher than the abnormal return of the firms with a high degree of earnings management and low actual fulfillment rate. The result of a t-test indicates statistical significance at the 5% level. It shows that the market reaction to the true signals is more significant than that of the false signals. In Table 6, Panel C lists the data on the downward revision of earnings forecasts regarding the 664 firms who announced stock repurchase plans. Among the 664 firms, 123 firms convey true signals and 60 convey false signals. On the event day (the event window is (0, 0)), the abnormal return of the firms with a high degree of earnings management and high actual fulfillment rate is higher

than the abnormal return of the firms with a low degree of earnings management and low actual fulfillment rate. The result of a t-test indicates significance at the 5% level. It shows that the market reaction to the true signals is more significant than that of the false signals. In Table 7, Panel A lists the data on 664 firms that announced stock repurchase plans. Judging by the upward revision of the earnings forecast, 105 firms convey true signals; judging by the downward revision of the earnings forecast, 60 firms convey false signals. On the event day (the event window is (0, 0)), the abnormal return of the firms with a high degree of upward revision of earnings forecasts and high actual fulfillment rate is higher than the abnormal return of the firms with a low degree of downward revision of earnings forecasts and low actual fulfillment rate. The result of a t-test indicates statistical significance at the 5% levels. It shows that the market reaction to the true signals is more significant than that of the false signals.

Table 6: Statistics of *CAR* on the Earnings Management as Announcement of Stock Repurchase Plan

Event Window (t_1,t_2) **t(*SCAR*)**	**Panel A:** The statistics of *CAR* on the absolute values of earnings management after announcement of stock repurchase plan			**Panel B:** The statistics of *CAR* on the upward revision of the earnings forecast, the after announcement of stock repurchase plan			**Panel C:** The statistics of *CAR* on the downward revision of the earnings forecast, the after announcement of stock repurchase plan		
	Abs	**Abs**	**Differen**	**(+) True**	**(+) False**	**Differen**	**(-) True**	**(-) False**	**Differen**
(0,0)	0.277***	0.058	0.218	0.332**	0.250	0.082	0.262**	-0.197	0.459**
	(2.77)	(0.473)	(1.38)	(2.10)	(1.32)	(0.333)	(2.02)	(-1.21)	(2.21)
(-1,+1)	1.72***	1.26***	0.459*	1.85***	0.933***	0.912**	1.68***	1.36***	0.318
	(10.3)	(5.72)	(1.66)	(6.94)	(2.91)	(2.19)	(7.74)	(4.53)	(0.858)
(0,2)	2.07***	1.96***	0.106	1.96***	1.97***	-0.010	2.18***	1.76***	0.420
	(10.3)	(7.65)	(0.326)	(6.61)	(5.10)	(-0.020)	(8.07)	(5.24)	(0.972)
(0,3)	2.06***	2.22***	-0.159	2.03***	2.10***	-0.061	2.12***	2.17***	-0.054
	(8.99)	(7.72)	(-0.433)	(5.90)	(4.95)	(-0.112)	(6.90)	(5.44)	(-0.107)
(-1,2)	1.92***	1.72***	0.205	1.74***	1.40***	0.340	2.13***	1.79***	0.342
	(9.69)	(6.47)	(0.616)	(5.67)	(3.52)	(0.678)	(8.17)	(5.12)	(0.785)
(-1,5)	2.21***	2.30***	-0.086	2.19***	1.77***	0.419	2.28***	2.58***	-0.294
	(9.23)	(7.24)	(-0.217)	(6.00)	(3.72)	(0.698)	(7.14)	(6.10)	(-0.555)

The regression model is $CAR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; The average CAR is estimated through the market model, abnormal returns are checked through the standardized-residual cross-sectional method and t (SCAR) indicates the t-value in the standardized-residual cross-sectional method. Abs True indicates the abnormal returns arising from a true signal represented by the absolute values of earnings management, Abs False indicates the abnormal returns arising from a false signal represented by the absolute values of earnings management, (+) True indicates the abnormal returns arising from a true signal represented by the upward revision of the earnings forecast, (+) False indicates the abnormal returns arising from a false signal represented by the upward revision of the earnings forecast, (-) True indicates the abnormal returns arising from a true signal represented by the downward revision of earnings forecast, and (-) False indicates the abnormal returns arising from a false signal represented by the downward revision of the earnings forecast. The difference is equal to the difference between the abnormal returns arising from a true signal and the abnormal returns arising from a false signal. ***, **, and * indicate that the statistics reach the significance levels of 1%, 5%, and 10%, respectively.*

In Table 7, Panel B lists the data regarding the 664 firms that announced stock repurchase plans. Judging by the upward revision of earnings forecasts, there are 123 firms who convey true signals and judging by the downward revision of earnings forecasts, there are 56 firms who convey false signals. During the period from the previous first day of the event day to the next first day of the event day (the event window is (-1, +1)), the abnormal return of the firms with a high degree of downward revision of earnings forecasts and high actual fulfillment rate is higher than the abnormal return of the firms with a high degree of upward revision of earnings forecasts and low actual fulfillment rate. The result of a t-test

indicates significance at the 10% level. It shows that the market reaction to the true signals is more significant than that of the false signals. According to the results described in Tables 6 and 7, the abnormal returns of the firms conveying true signals is higher than the abnormal return of the firms conveying false signals. Therefore, the aforementioned hypothesis is preliminarily verified. According to the results described in Tables 6 and 7, the abnormal return is significant in the event windows (0, 0) and (−1, +1), but not significant in other event windows. Therefore, this paper does not conduct any subsequent regression analysis for the event windows with no significant abnormal return. The significant *CAR* values produced in the two event windows are used as dependent variables for the regression analysis.

Regression Analysis

The regression equation, equation (1), incorporates a dummy variable representing true or false signals to discuss the influence on abnormal returns exerted by the announcement of stock repurchase plans. The research data is divided into two parts, the first part of the data is used for the analysis of all observations. The second part of data is used for an additional test. For example, a robustness test (the top 1% and bottom 1% extreme values are removed), classification of the observations by industries (firms in hi-tech industry and firms in traditional industries). The classification of the observations by repurchase purposes (Purpose 1 is to transfer shares to employees, and Purpose 3 is to support the stock prices), and classification of the observations by the bearish period or bullish period.

Tables 8 and 9 describe the regression results for all the observations and the robustness test (the top 1% and bottom 1% extreme values are removed). The market reaction to true signals (specifically, downward revision of the earnings forecast, and positive earnings management) is more significant than that to false signals (specifically, negative earnings management) on the event day; in other words, the true signals result in a significant, positive abnormal return on the event day. This result shows that stock repurchases indeed have the desired effect on the current day, thus verifying Hypothesis (when firms announce their stock repurchase plans, the *CAR* arising from the true signals is higher than the *CAR* arising from the false signals). Although the market reaction to true signals (specifically, upward revision of the earnings forecast, and positive earnings management) is more significant than that to false signals (specifically, negative earnings management), the *IOR* has a significant influence on the abnormal returns in the event windows (0, 0) and (-1, 1). This shows that the *IOR* is correlated with the firms' stock prices, and the firms' development trends can be judged by the *IOR*. Therefore, the *IOR* has a certain influence on the abnormal returns resulting from the announcement of stock repurchase plans. Tables 10 and 11 describe the regression results for the hi-tech industry and the traditional industries. In the hi-tech industry, the firms with a downward revision of the earnings forecast display a significant positive abnormal return in the event window (0, 0), and the coefficient value is 0.67; for the firms with an upward revision of earnings forecast (true signals are conveyed) and firms with a downward revision of earnings forecast (false signals are conveyed), a significant positive abnormal return is produced in the event window (0, 0), and the coefficient values are 0.70 and 0.67 respectively. In the traditional industries, for the firms with a downward revision of earnings forecast (true signals are conveyed) and firms with an upward revision of earnings forecast (false signals are conveyed), a significant positive

abnormal return is produced in the event window (-1, 1), and the coefficient value is 1.73. In sum, the hi-tech industry has a significant positive abnormal return in three circumstances, while the traditional industries have a significant positive abnormal return in one circumstance only. Therefore, the hi-tech industry has more significant abnormal returns than traditional industries. In the hi-tech industry, the market reaction to the signals conveyed by firms is very significant; this is consistent with Hypothesis (when firms announce their stock repurchase plans, the *CAR* arising from the true signals is higher than the *CAR* arising from the false signals). Panel B in Table 11 lists the regression results for Purpose 1 and Purpose 3. Purpose 1 is to transfer shares to employees, and Purpose 3 is to maintain firm credit and shareholders' equity and cancel the related shares. On the day before, and the day after the announcement day, the firms with Purpose 3 have more significant positive abnormal returns than the firms with Purpose

1. Therefore, the market reaction to Purpose 3 is more significant than that to Purpose 1; for the firms with Purpose 3 that make a downward revision of the earnings forecast (a true signal) and make an upward revision of the earnings forecast (a false signal), the *CDY* coefficients are 0.08 and 0.18, respectively, in the event windows (0, 0) and (-1, 1), indicating a significant, positive abnormal return. This shows that upon the announcement of stock repurchase plans, a high *CDY* will attract investors to purchase the stocks of the firms. Therefore, for the firms with Purpose 3, *CDY* influences on the firms' *CAR*. In contrast, no significant *CAR* is observed for the firms with Purpose 1, so Hypothesis cannot be verified.

Table 7: Statistics of *CAR* on the True or False Share Repurchase Signal after the Upward Revision of Earnings Forecast/ the Downward Revision of Earnings Forecast

Event Window(t_1,t_2)	**Panel A:** The statistics of *CAR* on the true repurchase signal after the upward revision of earnings forecast and the false repurchase signal after the downward revision of earnings forecast			**Panel B:** The statistics of *CAR* on the true repurchase signal after the downward revision of earnings forecast and the false repurchase signal after the upward revision of earnings forecast		
	(+) True	**(-) False**	**Difference**	**(-) True**	**(+) False**	**Difference**
(0,0)	0.332**	-0.197	0.529**	0.262**	0.250	0.012
	(2.10)	(-1.21)	(2.33)	(2.02)	(1.32)	(0.052)
(-1,+1)	1.85***	1.36***	0.485	1.68***	0.933***	0.745*
	(6.94)	(4.53)	(1.21)	(7.74)	(2.91)	(1.93)
(0,2)	1.96***	1.76***	0.194	2.18***	1.97***	0.216
	(6.61)	(5.24)	(0.433)	(8.07)	(5.10)	(0.458)
(0,3)	2.03***	2.17***	-0.139	2.12***	2.09***	0.024
	(5.90)	(5.44)	(-0.264)	(6.90)	(4.95)	(0.047)
(-1,2)	1.74***	1.79***	-0.052	2.13***	1.40***	0.734
	(5.66)	(5.12)	(-0.111)	(8.17)	(3.52)	(1.55)
(-1,5)	2.19***	2.58***	-0.385	2.28***	1.77***	0.510
	(6.00)	(6.10)	(-0.689)	(7.14)	(3.72)	(0.890)

The regression model is
$CAR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; The average CAR is estimated through the market model, abnormal returns are checked through the standardized-residual cross-sectional method, and t (SCAR) indicates the t-value in the standardized-residual cross-sectional method. (+) True indicates the abnormal returns arising from a true signal represented by the upward revision of the earnings forecast, (+) False indicates the abnormal returns arising from a false signal represented by the upward revision of the earnings forecast, (-) True indicates the abnormal returns arising from a true signal represented by the downward revision of earnings forecast, and (-) False indicates the abnormal returns arising from a false signal represented by the downward revision of the earnings forecast. The difference is equal to the difference between the abnormal returns arising from a true signal and the abnormal returns arising from a false signal. ***, **, and * indicate that the statistics reach the significance levels of 1%, 5%, and 10%, respectively.*

Table 8: Regression Analysis Results of All Observations

Variables	**Panel A:** The statistics of *CAR* after the upward revision of earnings forecast, the true repurchase signal > the false repurchase signal		**Panel B:** The statistics of *CAR* after the downward revision of earnings forecast, the true repurchase signal > the false repurchase signal		**Panel C:** The statistics of *CAR* after the upward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the downward revision of earnings forecast on the false repurchase signal		**Panel D:** The statistics of *CAR* after the downward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the upward revision of earnings forecast on the false repurchase signal	
Model	**(1) *CAR*(0,0)**	**(2) *CAR*(-1,1)**	**(1) *CAR*(0,0)**	**(2) *CAR*(-1,1)**	**(1) *CAR*(0,0)**	**(2) *CAR*(-1,1)**	**(1) *CAR*(0,0)**	**(2) *CAR*(-1,1)**
Intercept	2.47 ***	3.68 ***	0.13	1.99**	1.42**	3.08***	0.90	2.43**
	(3.51)	(2.85)	(0.22)	(1.97)	(2.20)	(2.63)	(1.37)	(2.25)
SIGNAL	-0.09	0.55	0.55**	0.43	0.45*	0.44	-0.01	0.49
	(-0.32)	(1.00)	(2.17)	(0.98)	(1.63)	(0.87)	(-0.04)	(1.09)
ln(Size)	0.00	-0.00	-0.00*	-0.00	-0.00	-0.00	-0.00*	-0.00**
	(0.29)	(-0.74)	(-1.80)	(-1.56)	(-0.55)	(-0.49)	(-1.62)	(-2.24)
BM	-0.37	-0.17	-0.08	-0.16	-0.26	0.04	-0.13	-0.50
	(-1.56)	(-0.40)	(-0.41)	(-0.51)	(-1.16)	(0.09)	(-0.64)	(-1.49)
IOR	-0.03***	-0.04**	-0.01	-0.01	-0.03***	-0.04**	-0.01	-0.02
	(-3.11)	(-2.19)	(-0.78)	(-0.76)	(-2.86)	(-2.10)	(-0.84)	(-1.01)
IPR	-0.00	-0.01	0.00	-0.00	0.00	-0.00	-0.00	-0.01
	(-1.14)	(-1.16)	(0.95)	(-0.27)	(0.09)	(-0.08)	(-0.12)	(-1.58)
GRW	-0.00*	-0.00	0.00	0.01	0.01	0.01	-0.00	-0.00
	(-1.66)	(-0.56)	(1.30)	(1.27)	(1.23)	(0.83)	(-1.45)	(-0.73)
CAP	0.16	-0.25	-1.67	-2.08	-0.18	-0.25	-1.16	-2.42
	(0.11)	(-0.10)	(-1.21)	(-0.88)	(-0.13)	(-0.10)	(-0.80)	(-1.01)
DER	0.16	0.04	-0.04	-0.04	0.11	0.11	-0.02	-0.01
	(1.11)	(0.14)	(-1.01)	(-0.64)	(0.75)	(0.40)	(-0.65)	(-0.25)
CDY	-0.02	-0.01	0.01	0.09	-0.03	-0.03	0.02	0.13**
	(-0.49)	(-0.11)	(0.22)	(1.35)	(-0.63)	(-0.42)	(0.53)	(2.01)
DevA	0.03	0.02	-0.01	0.01	0.03*	0.02	-0.01	0.01
	(1.51)	(0.52)	(-0.38)	(0.37)	(1.72)	(0.63)	(-0.56)	(0.18)
DevB	-0.01**	-0.01	0.00	-0.01	-0.01	-0.01	-0.00	-0.00
	(-2.20)	(-1.08)	(0.02)	(-0.71)	(-1.27)	(-0.86)	(-0.14)	(-0.38)
Adj-R^2	0.03	-0.02	0.01	-0.02	0.03	-0.03	-0.03	0.03

The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Adj-R^2 is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively.*

Table 12 lists the regression results for bearish periods and bullish periods. In bearish periods, the downward revision of the earnings forecast results in a significant abnormal return in the event windows (0, 0) and (−1, 1); the upward revision of the earnings forecast (a true signal) and downward revision of the earning forecast (a false signal) also result in a significant abnormal return in the event window (0, 0). However, no significant abnormal returns are observed in bullish periods. In sum, a significant, positive abnormal return

Table 9: Robustness Test Results of All Observations (Removed the Top 1% and Bottom 1% Extreme Values of All Observations)

Variables	**Panel A:** The statistics of *CAR* after the upward revision of earnings forecast, the true repurchase signal > the false repurchase signal		**Panel B:** The statistics of *CAR* after the downward revision of earnings forecast, the true repurchase signal > the false repurchase signal		**Panel C:** The statistics of *CAR* after the upward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the downward revision of earnings forecast on the false repurchase signal		**Panel D:** The statistics of *CAR* after the downward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the upward revision of earnings forecast on the false repurchase signal	
Model	**(1) *CAR*(0,0)**	**(2) *CAR*(-1,1)**	**(1) *CAR*(0,0)**	**(2) *CAR*(-1,1)**	**(1) *CAR*(0,0)**	**(2) *CAR*(-1,1)**	**(1) *CAR*(0,0)**	**(2) *CAR*(-1,1)**
Intercept	2.32***	3.27***	-0.14	2.09**	1.30**	2.74**	0.60	2.54**
	(3.55)	(2.79)	(-0.24)	(2.14)	(2.15)	(2.54)	(0.96)	(2.42)
SIGNAL	-0.09	0.48	0.51**	0.32	0.49*	0.42	-0.05	0.37
	(-0.34)	(0.97)	(2.09)	(0.75)	(1.91)	(0.91)	(-0.17)	(0.85)
ln(Size)	0.00	-0.00	-0.00*	-0.00	-0.00	-0.00	-0.00	-0.00**
	(0.17)	(-1.16)	(-1.73)	(-1.47)	(-0.79)	(-0.93)	(-1.54)	(-2.14)
BM	-0.37*	-0.21	-0.03	-0.09	-0.27	0.01	-0.09	-0.41
	(-1.69)	(-0.54)	(-0.14)	(-0.28)	(-1.30)	(0.03)	(-0.45)	(-1.26)
IOR	-0.03***	-0.04**	-0.01	-0.02	-0.03***	-0.04**	-0.01	-0.02
	(-3.07)	(-2.02)	(-0.58)	(-0.97)	(-2.85)	(-1.97)	(-0.59)	(-1.21)
IPR	-0.01	-0.01	0.01	-0.00	-0.00	-0.00	0.00	-0.01
	(-1.33)	(-1.21)	(1.12)	(-0.16)	(-0.11)	(-0.14)	(0.03)	(-1.53)
GRW	-0.00*	-0.00	0.00*	0.01	0.01	0.01	-0.00	-0.00
	(-1.69)	(-0.49)	(1.60)	(1.36)	(1.37)	(1.15)	(-1.43)	(-0.63)
CAP	0.54	0.39	-1.74	-2.08	0.16	0.47	-1.28	-2.27
	(0.41)	(0.17)	(-1.33)	(-0.91)	(0.12)	(0.20)	(-0.93)	(-0.98)
DER	0.13	0.00	-0.04	-0.05	0.09	0.08	-0.03	-0.02
	(1.02)	(0.01)	(-1.16)	(-0.75)	(0.67)	(0.30)	(-0.79)	(-0.36)
CDY	-0.03	0.01	0.02	0.06	-0.03	-0.02	0.04	0.10
	(-0.70)	(0.09)	(0.64)	(0.95)	(-0.84)	(-0.26)	(0.95)	(1.56)
DevA	0.04**	0.03	-0.01	0.02	0.04**	0.03	-0.01	0.01
	(2.09)	(1.10)	(-0.38)	(0.61)	(2.24)	(1.11)	(-0.57)	(0.43)
DevB	-0.01*	-0.01	0.00	-0.01	-0.00	-0.00	0.00	-0.00
	(-1.66)	(-0.58)	(0.13)	(-0.76)	(-0.73)	(-0.41)	(0.02)	(-0.43)
Adj-R^2	0.04	-0.01	0.02	-0.02	0.05	-0.02	-0.03	0.02

The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Adj-*R^2 *is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively*

Table 10: Regression Analysis Results of Hi-Tech Industry / Traditional Industry

Variables	**Panel A:** The statistics of *CAR* after the downward revision of earnings forecast, the true repurchase signal > the false repurchase signal				**Panel B:** The statistics of *CAR* after the upward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the downward revision of earnings forecast on the false repurchase signal			
	Hi-Tech Industry		**Traditional Industry**		**Hi-Tech Industry**		**Traditional Industry**	
Model	(1) *CAR*(0,0)	(2) *CAR*(-1,1)	(1) *CAR*(0,0)	(2) *CAR*(-1,1)	(1) *CAR*(0,0)	(2) *CAR*(-1,1)	(1) *CAR*(0,0)	(2) *CAR*(-1,1)
Intercept	0.20	2.59**	0.06	1.97	1.49*	3.05**	1.00	1.67
	(0.28)	(2.23)	(0.04)	(0.79)	(1.93)	(2.26)	(0.70)	(0.62)
SIGNAL	0.67**	0.44	0.23	0.71	0.70**	0.91	-0.24	-0.82
	(2.10)	(0.84)	(0.49)	(0.83)	(1.98)	(1.46)	(-0.49)	(-0.89)
ln(Size)	-0.00*	-0.00	-0.00	-0.00**	-0.00	-0.00	0.00	0.00*
	(-1.95)	(-1.55)	(-0.64)	(-2.17)	(-0.42)	(-0.75)	(0.19)	(1.96)
BM	-0.27	-0.39	0.28	0.13	-0.21	-0.06	-0.01	1.19
	(-1.11)	(-0.99)	(0.59)	(0.14)	(-0.78)	(-0.13)	(-0.02)	(1.13)
IOR	-0.02	-0.04*	0.01	0.01	-0.04***	-0.05**	0.00	0.01
	(-1.22)	(-1.62)	(0.27)	(0.34)	(-3.12)	(-2.33)	(0.12)	(0.27)
IPR	-0.00	-0.01	0.01**	0.01	-0.00	0.01	-0.00	-0.01
	(-0.63)	(-1.02)	(2.02)	(0.72)	(-0.43)	(0.59)	(-0.05)	(-1.05)
GRW	0.00	0.01	0.01*	0.00	0.01	0.02	0.00	-0.00
	(0.65)	(0.97)	(1.62)	(0.53)	(1.14)	(1.49)	(0.54)	(-0.33)
CAP	-2.09	-2.52	-0.40	-4.95	0.05	3.80	-0.78	-3.84
	(-1.24)	(-0.91)	(-0.15)	(-1.01)	(0.02)	(0.97)	(-0.37)	(-0.96)
DER	0.18	0.19	-0.07*	-0.11	0.13	0.17	-0.24	-0.45
	(0.95)	(0.59)	(-1.69)	(-1.53)	(0.68)	(0.51)	(-0.72)	(-0.73)
CDY	0.02	0.11	-0.01	0.05	-0.02	0.03	-0.07	-0.17
	(0.40)	(1.41)	(-0.07)	(0.36)	(-0.37)	(0.32)	(-0.81)	(-1.03)
DevA	-0.01	-0.00	0.00	0.05	0.03	0.04	0.03	-0.02
	(-0.28)	(-0.13)	(0.06)	(0.89)	(1.10)	(0.84)	(0.80)	(-0.31)
DevB	0.00	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	-0.03
	(0.47)	(-0.46)	(-1.32)	(-1.07)	(-0.77)	(-0.56)	(-0.84)	(-1.31)
Adj-R^2	0.01	-0.00	0.08	0.09	0.06	-0.00	-0.20	-0.05

The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Adj-R^2 is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively.*

is observed under four circumstances in bearish periods, whereas no significant abnormal returns are observed in bullish periods. It shows that upon the announcement of stock repurchase plans, it can be observed that only in bearish periods are the abnormal returns arising from the true signals higher than the

Table 11: Regression Analysis Results of Hi-Tech Industry / Traditional Industry/ Repurchase Purpose

Variables	**Panel A:** The statistics of *CAR* after the downward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the upward revision of earnings forecast on the false repurchase signal	**Panel B:** The statistics of *CAR* after the downward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the upward revision of earnings forecast on the false repurchase signal

	Hi-Tech Industry		**Traditional Industry**		**Transfer Shares to Employees**		**Maintain Firm Credit and Shareholders' Equity**	
Model	(1) *CAR*(0,0)	(2) *CAR*(-1,1)	(1) *CAR*(0,0)	(2) *CAR*(-1,1)	(1) *CAR*(0,0)	(2) *CAR*(-1,1)	(1) *CAR*(0,0)	(2) *CAR*(-1,1)
Intercept	1.35*	3.46***	1.26	2.42	1.90*	2.55	0.33	1.64
	(1.63)	(2.72)	(0.91)	(0.93)	(1.74)	(1.51)	(0.38)	(1.04)
SIGNAL	-0.30	0.29	0.39	1.73**	-0.05	-0.02	0.15	1.16*
	(-0.77)	(0.48)	(1.02)	(2.37)	(-0.11)	(-0.03)	(0.41)	(1.70)
ln(Size)	-0.00*	-0.00**	-0.00	-0.00	-0.00	0.00	-0.00	-0.00**
	(-1.92)	(-2.31)	(-0.39)	(-1.45)	(-0.39)	(1.13)	(-0.98)	(-2.44)
BM	-0.28	-0.63	-0.14	-0.92	-0.27	0.25	0.00	-0.74
	(-0.99)	(-1.45)	(-0.39)	(-1.35)	(-0.72)	(0.44)	(0.01)	(-1.54)
IOR	-0.02	-0.05**	-0.01	0.01	-0.02	-0.02	-0.01	-0.00
	(-1.16)	(-2.13)	(-0.58)	(0.38)	(-1.13)	(-1.05)	(-0.48)	(-0.12)
IPR	-0.01*	-0.02*	0.01	-0.01	0.00	-0.01	-0.01	-0.01
	(-1.83)	(-1.60)	(1.39)	(-0.99)	(0.34)	(-1.10)	(-0.86)	(-0.63)
GRW	-0.00	0.00	-0.00*	-0.00	-0.00	0.00	-0.00**	-0.00
	(-0.26)	(0.14)	(-1.66)	(-1.53)	(-0.29)	(0.41)	(-2.08)	(-0.56)
CAP	-2.11	-5.33*	1.59	-0.10	1.50	2.03	-1.20	-4.19
	(-1.13)	(-1.86)	(0.61)	(-0.02)	(0.56)	(0.49)	(-0.56)	(-1.08)
DER	0.12	-0.05	-0.02	0.02	-0.02	-0.04	0.05	-0.32
	(0.51)	(-0.14)	(-0.66)	(0.24)	(-0.37)	(-0.58)	(0.20)	(-0.71)
CDY	0.07	0.16**	-0.07	0.18	-0.10	0.08	0.08*	0.18*
	(1.30)	(1.96)	(-1.06)	(1.49)	(-1.05)	(0.56)	(1.72)	(2.09)
DevA	-0.02	-0.02	0.00	0.02	-0.02	0.02	0.00	-0.01
	(-0.68)	(-0.56)	(0.07)	(0.45)	(-0.88)	(0.54)	(0.16)	(-0.10)
DevB	0.00	-0.00	-0.01	-0.02	0.01	-0.01	-0.01	0.00
	(0.12)	(-0.20)	(-0.78)	(-1.00)	(0.51)	(-0.88)	(-0.91)	(0.09)
Adj-R^2	-0.01	0.06	0.03	0.19	-0.05	-0.05	-0.01	0.04

The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Purpose 3 is to maintain firm credit and shareholders' equity and cancel the related shares, and Purpose 1 is to transfer shares to employees. Adj-R^2 is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively.*

abnormal returns arising from the false signals. Therefore, abnormal returns of firms comply with Hypothesis only in bearish periods. According to the analysis of Table 12, the market reaction to the announcement of stock repurchase plans varies with the degree of earnings management and types of samples. For all samples and robustness test (the top 1% and bottom 1% extreme values are removed), the results are consistent, complying with Hypothesis. When all the observations are classified into firms in

hi-tech industry and firms in traditional industries, the *CAR* in the hi-tech industry is more significant than the *CAR* in traditional industries. Therefore, the analysis results about the firms in the hi-tech industry are consistent with Hypothesis. When all the observations are classified by the purpose of stock repurchases, the analysis results regarding Purpose 3 are consistent with Hypothesis, whereas Hypothesis cannot be verified for the enterprises with Purpose 1. When all the observations are classified by bearish or bullish periods, no significant abnormal returns are observed in any event window in bullish periods, so Hypothesis cannot be verified; in contrast, the analysis results regarding the observations in bearish periods are consistent with Hypothesis. Possibly, an information asymmetry exists between firm managers and market participants. Therefore, a significant, the positive abnormal return is produced in the short term if the stock prices of firms are underestimated and the firms convey true signals (specifically, a below-average degree of earnings management and an above-average fulfillment rate) to market. When abnormal returns arising from a true signal are indeed higher than the abnormal returns arising from a false signal, the stock market is able to reflect the effect of the signals (true or false) on the announcement day, but does not need to judge the signals (true or false) when stock repurchases is subsequently fulfilled. This shows that the signals can indeed reflect the effect of the announcement of stock repurchase plans.

CONCLUSIONS

There exists an information asymmetry between firm managers and market participants. When firms announce stock repurchase plans in Taiwan's open stock market, they may give investors a signal that their stock prices are underestimated, and lead investors to react to the announcement, with the intent to boost the stock prices to their true value. For their own benefits, however, firm managers may convey false signals to the investors through earnings manipulation. In other words, the firms' stock prices are not underestimated, but the firm managers try to convince market participants that their firm equity is underestimated, thus misleading market participants into making incorrect decisions. This study further explores how the financial statements with earnings manipulation influence stock prices. This study is oriented toward the stock repurchase events regarding Taiwan's publicly listed firms and tries to explore the relationship between earnings management before the announcement of stock repurchase plans and actual fulfillment rate. Among all sampled firms, for the firms with a below-average degree of upward/downward revision of earnings forecasts on the announcement day and an above-average actual fulfillment rate, market reaction to true signals is more significant than that to false signals (specifically, a significant positive abnormal return is observed). This result is consistent with the results obtained in the robustness test (the top 1% and bottom 1% extreme values are removed).

Evidently, investor reactions to the announcement of stock repurchase plans somewhat vary with the signals (true or false) conveyed by firm managers. Abnormal returns arising from true signals are higher than those arising from false signals are; this is consistent with Hypothesis. Further, the phenomenon described in Hypothesis is more significant in the hi-tech industry than in traditional industries. For the firms with Purpose 3, a significant, positive abnormal return is observed on the day before and the day after the announcement day. However, this result cannot be observed for the firms with Purpose 1. For the firms that announce stock repurchase plans in bullish periods, abnormal returns are not significant; for the firms that announce stock repurchases in bearish periods, a significant, positive abnormal return is observed. This shows that abnormal returns vary with the periods in which stock repurchase plans are announced. In bearish periods, the conclusion about the observations is consistent with Hypothesis. Therefore, investors must give careful consideration when making decisions, and observe whether firms intend to cover up their earnings management decisions by announcing stock repurchase plans. Abnormal returns are significant only when the firms convey true signals. Investors should stay away from firms with high discretionary accruals but invest in firms with low discretionary accruals. The paper is limited in the selection of Taiwanese listed firms as the research object and collected data from the database of the Taiwan Economic Journal (TEJ). Some are not included in the sample. Firms demoted as full-cash delivery stocks, financial and securities firms, and industries with less than 15 sample firms are notably absent from the sample. In a future study, another interesting extension of this paper would be a more detailed examination of correlation between earnings management induced financial distress and stock

repurchase plans affected trade union. In a further study, we could put firm age and the downward/ upward revision of the earnings forecast frequency into the model to examine how earnings management induced stock repurchase plans affect stock price volatility.

Table 12: The Regression Analysis Results of Bullish Periods/ Bearish Periods

Variables	**Panel A:** The statistics of *CAR* after the downward revision of earnings forecast, the true repurchase signal > the false repurchase signal				**Panel B:** The statistics of *CAR* after the upward revision of earnings forecast, the true repurchase signal > The statistics of *CAR* after the downward revision of earnings forecast on the false repurchase signal			
	Bullish Period		**Bearish Period**		**Bullish Period**		**Bearish Period**	
Model	**(1)** ***CAR*(0,0)**	**(2)** ***CAR*(-1,1)**	**(1)** ***CAR*(0,0)**	**(2)** ***CAR*(-1,1)**	**(1)** ***CAR*(0,0)**	**(2)** ***CAR*(-1,1)**	**(1)** ***CAR*(0,0)**	**(2)** ***CAR*(-1,1)**
Intercept	0.47	2.69**	-0.62	1.29	2.15*	6.03***	0.58	1.16
	(0.55)	(1.97)	(-0.71)	(0.86)	(1.70)	(2.84)	(0.71)	(0.74)
SIGNAL	0.20	-0.35	0.76**	1.00*	0.47	0.13	0.61*	0.34
	(0.50)	(-0.55)	(2.16)	(1.67)	(0.97)	(0.16)	(1.64)	(0.48)
ln(Size)	-0.00**	0.00	0.00	-0.00**	-0.00	-0.00	0.00	-0.00
	(-2.06)	(0.32)	(0.09)	(-2.52)	(-1.16)	(-0.63)	(1.54)	(-0.42)
BM	0.35	-0.03	-0.06	-0.09	-0.31	0.10	-0.11	0.15
	(0.95)	(-0.05)	(-0.23)	(-0.23)	(-0.60)	(0.11)	(-0.43)	(0.29)
IOR	-0.02	-0.02	0.00	-0.02	-0.04***	-0.07***	-0.02	-0.02
	(-1.34)	(-0.96)	(0.02)	(-0.54)	(-2.61)	(-2.62)	(-1.32)	(-0.67)
IPR	0.00	-0.01	0.01	0.01	0.00	-0.01	0.00	0.00
	(0.55)	(-1.31)	(1.10)	(0.93)	(0.04)	(-0.46)	(0.16)	(0.45)
GRW	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.02
	(1.53)	(1.33)	(1.47)	(0.69)	(1.18)	(0.36)	(0.71)	(1.21)
CAP	-0.40	-0.93	-2.29	-2.86	1.04	2.27	0.42	-1.18
	(-0.17)	(-0.24)	(-1.28)	(-0.94)	(0.30)	(0.39)	(0.26)	(-0.38)
DER	-0.09	0.14	-0.05	-0.07	0.17	0.04	0.05	0.07
	(-0.41)	(0.42)	(-1.16)	(-1.00)	(0.48)	(0.07)	(0.31)	(0.23)
CDY	0.03	0.21**	0.00	0.07	0.02	-0.09	-0.06	-0.00
	(0.48)	(1.99)	(0.04)	(0.71)	(0.20)	(-0.63)	(-1.19)	(-0.05)
DevA	0.05*	0.07	-0.04	-0.02	0.02	-0.02	0.04*	0.05
	(1.69)	(1.61)	(-1.58)	(-0.38)	(0.44)	(-0.37)	(1.71)	(1.09)
DevB	-0.01	-0.02	0.01	-0.00	-0.02	-0.02	-0.00	-0.00
	(-1.57)	(-1.52)	(1.04)	(-0.03)	(-1.39)	(-1.06)	(-0.25)	(-0.16)
Adj-R^2	0.03	0.04	0.01	0.01	-0.01	-0.00	0.03	-0.10

The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Adj-R^2 is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively.*

REFERENCES

Baker, H. K., G. E. Powell, and E. T. Veit (2003) "Why Companies Use Open-Market Repurchases: A Managerial Perspective," *The Quarterly Review of Economics and Finance*, vol. 43(3), p. 483-504.

Bartov, E. (1991) "Open-Market Stock Repurchases as Signals for Earnings and Risk Changes," *Journal of Accounting and Economics*, vol. 14, p. 275-294.

Becker, C. L., M. L. DeFond, J. Jiambalvo, and K. Subramanyam (1998) "The Effect of Audit Quality on

Earnings Management," *Contemporary Accounting Research*, vol. 15(1), p. 1-24.

Bhattacharya, S. (1979) "Imperfect Information, Dividend Policy, and the Bird in the Hand Fallacy," *Bell Journal of Economics*, vol. 10(1), p. 259-270.

Choi, D. and S. Chen (1997) "The Differential Information Conveyed by Share Repurchase Tender Offers and Dividend Increases," *The Journal of Financial Research*, vol. 20, p. 529-543.

Chou, D. W. and J. R. P. Lin (2003) "False Signals from Stock Repurchase Announcements: Evidence from Earnings Management and Analysts' Forecast Revisions," *Social Science Research Network (SSRN)*, November, p. 1-38.

Comment, R. and G. Jarrell (1991) "The Relative Signaling Power of Dutch Auction and Fixed Price Self-Tender Offers and Open-Market Share Repurchases," *The Journal of Finance*, vol. 46, p. 1243-1271.

Dann, L. Y. (1981) "Common Stock Repurchases: An Analysis of Returns to Bondholders and Stockholders," *Journal of Financial Economics*, vol. 9(2), p. 113-138.

Dann, L.Y., R.W. Masulis, and D. Mayers (1991) "Repurchase Tender Offers and Earnings Information," *Journal of Accounting and Economics*, vol. 14(3), p. 217-251.

DeFond, M. L. and J. Jiambalvo (1994) "Debt Covenant Violation and Manipulation of Accruals," *Journal of Accounting and Economics*, vol. 17(1), p. 145-176.

Dittmar, A. K. (2000) "Why Do Firms Repurchase Stock," *Journal of Business*, vol. 73(3), p. 331-355.

Fama, E. F. (1970) "Efficient Capital Markets: A Review of Theory and Empirical Work," *The Journal of Finance*, vol. 25, p. 383-417.

Francis, J. and K. Schipper (1999) "Have Financial Statements Lost Their Relevance?" *Journal of Accounting Research*, vol. 37(2), p. 319-352.

Grullon, G. and D. L. Ikenberry (2000) "What Do We Know about Stock Repurchases?" *Journal of Applied Corporate Finance*, vol. 13(1), p. 31-51.

Ikenberry, D., J. Lakonishok, and T. Vermaelen (1995) "Market Underreaction to Open Market Share Repurchases," *Journal of Financial Economics*, vol. 39(2), p. 181-208.

Ikenberry, D., J. Lakonishok, and T. Vermaelen (2000) "Stock Repurchases in Canada: Performance and Strategic Trading," *The Journal of Finance*, vol. 55(5), p. 2373-2397.

Jensen, M. C. (1986) "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *The American Economic Review*, vol. 76(2), p. 323-329.

Jones, J. J. (1991) "Earnings Management during Import Relief Investigations," *Journal of Accounting Research*, vol. 29(2), p. 193-228.

Kothari, S. P., A. J. Leone, and C. E. Wasley (2005) "Performance Matched Discretionary Accrual Measures," *Journal of Accounting and Economics*, vol. 39(1), p. 163-197.

Kracher, Beverly and Robert R. Johnson (1997) "Repurchase Announcements, Lies and False Signals," *Journal of Business Ethics*, vol. 16, p. 1677-1685.

Liu, C. S. and D. A. Ziebart (1997) "Stock Returns and Open-Market Stock Repurchase Announcements," *Financial Review*, vol. 32, p. 709-728.

Miller, M. H. and K. Rock (1985) "Dividend Policy under Asymmetric Information," *The Journal of Finance*, vol. 40(4), p. 1031-1051.

Netter, J. M. and M. L. Mitchell (1989) "Stock-Repurchase Announcements and Insider Transactions after the October 1987 Stock Market Crash," *Financial Management*, vol. 18(3), p. 84-96.

Nohel, Tom and Vefa Tarhan (1998) "Share Repurchases and Firm Performance: New Evidence on the Agency Costs of Free Cash Flow," *Journal of Financial Economics*, vol. 49, p. 187-222.

Penman, S. H. (1982) "Insider Trading and Dissemination of Firm's Forecast Information," *Journal of Business*, vol. 55(4), p. 479-503.

Raad, E. and H. Wu (1995) "Insider Trading Effects on Stock Returns around Open-Market Stock Repurchase Announcements: An Empirical Study," *The Journal of Financial Research*, vol. 18(1), p. 45-57.

Rozeff, M. S. and M. A. Zaman (1988) "Market Efficiency and Insider Trading: New Evidence," *Journal of Business*, vol. 61(1), p. 25-44.

Stephens, C. P. and M. S. Weisbach (1998) "Actual Share Reacquisitions in Open-Market Repurchase Programs," *The Journal of Finance*, vol. 53(1), p. 313-333.

Subramanyam, K. (1996) "The Pricing of Discretionary Accruals," *Journal of Accounting and Economics*, vol. 22(1), p. 249-281.

Tsetsekos, G. P. (1993) "Valuation Effects of Open Market Stock Repurchases for Financially Weak Firms," *Review of Financial Economics*, vol. 2(2), p. 29-42.

Vermaelen, T. (1981) "Common Stock Repurchases and Market Signaling: An Empirical Study," *Journal of Financial Economics*, vol. 9(2), p. 139-183.

Vermaelen, T. (1984) "Repurchase Tender Offers, Signaling, and Managerial Incentives," *Journal of Financial and Quantitative Analysis*, vol. 19(2), p. 163-181.

Wansley, J. W., W. R. Lane, and S. Sarkar (1989) "Managements' View on Share Repurchase and Tender Offer Premiums," *Financial Management*, vol. 18(3), p. 97-110.

Wiggins, J. B. (1994) "Open Market Stock Repurchase Programs and Liquidity," *The Journal of Financial Research*, vol. 17(2), p. 217-229.

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DERIVATIVES MARKETS AND MANAGED MONEY: IMPLICATIONS FOR PRICE DISCOVERY

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ABSTRACT

Derivatives markets determination of commodities prices should largely be based on production and utilization of the underlying commodity. Certainly, government programs designed to impact production or utilization including expectations associated with those programs, as well as, weather, geopolitical issues, related commodity dynamics, terrorism, etc. could potentially impact prices. Derivatives markets participants such as producers, merchants, warehousers, processors and end users play a fundamental role of providing liquidity through their management of risk. Of increasing significance is managed money. Hedge funds, commodities index contracts, and commodity Exchange Traded Funds (ETFs) are types of managed money that look to commodity derivatives markets to speculate. This research project utilizes panel data, commodities prices and Commodities Futures Trading Commission (CFTC) data on Commitment of Traders (COT) to isolate the impact that managed money has on commodities prices. To this end we employ regression analysis to analyze various periods of time to test our hypothesis that the flow of managed money into and out of commodities derivatives markets creates price changes not consistent with production and utilization.

JEL: G10

KEYWORDS: Price Discovery, Managed Futures, Commitment of Traders, Regression, Hedge Funds, Managed Money, Speculation, Derivatives, Futures, Options, Swaps, CFTC

INTRODUCTION

Price discovery in futures markets involves many variables. Those variables certainly include production, utilization, trends in both, and other variables, including government programs, weather, geopolitical events, etc. to mention a few. In addition to these basic underlying supply and demand fundamental variables, derivatives markets have emerged for important and natural reasons, primarily, risk management for producers, merchandisers, warehousers and processors. In order for risk managers to successfully hedge their price risk associated with physical ownership of the underlying commodity, in this case cocoa, the market needs to be sufficiently liquid. Liquidity comes from other industry participants and speculators and is important for the function of the markets.

Of particular interest in this group of speculators are managed money. Managed money, including hedge funds, are actively seeking returns in many markets, including commodity derivative markets. Hedge fund activity can range from no active positions to long or short positions for various lengths of time. Regardless, the producers, merchants, swap dealers and other market participants have risk to manage. Hedge funds, Exchange Traded Funds, and Index Funds, known collectively as managed money, are not managing risk. Rather, they are seeking risk and profit opportunities. Managed money's activity in these commodities markets does bring arbitrage and liquidity, but also price movement that may not be consistent with the underlying market fundamentals. The purpose of this research is to show that managed money significantly impacts cocoa derivatives markets.

The remainder of this paper is organized as follows. We provide a review related literature and examine how it relates to this research. Next, data collection and methodology are explained, with statistical results and a corresponding analysis. The paper ends with a conclusion of this research paper, its limitations, and goals for future research.

LITERATURE REVIEW

In recent years, related literature has researched price discovery in both the spot and futures markets. Of specific interest is whether price discovery occurs in one market before the other, or both simultaneously. Additionally, it is necessary to examine which section of market participants drives the price. Price discovery means defining the actual dollar value of a commodity, security, or other similar asset. Garbade and Silber (1983) studied price discovery in the wheat and corn futures markets. Their findings supported the role of the futures market in price discovery. In this instance, around three fourths of pricing happened in the futures market. An analysis of oat futures, a smaller and less liquid market, demonstrated the significance of market size in price discovery. Price discovery of oats was determined to happen equally between the spot and futures markets. Tornell and Yuan (2011) studied how peaks and troughs in the foreign currency futures market affected the price in the corresponding spot market. They discovered that speculative peaks and hedging trough correlate to future price continuation. The opposing positions correspond with negative associations of future spot price changes.

Brandt, Kavajecz, and Underwood (2007) support the idea that the type of trader can produce contrasting results on price changes. Their regression analyses showed that retail customers drive prices in the direction of their trades, while exchange members move prices opposite of their positions. Retail customers are also referred to as speculators; they are reported as "managed money" in the Commitment of Traders report. Exchange members primarily use futures trading as a hedging method. Chen, Gau, and Liao (2014) used Commitment of Traders (COT) reports of currency futures to study the effects that speculators and hedgers had on the market. They utilized regression tests on net positions to determine that an increase in hedger positions decreases its price discovery contribution, while an increase in speculator positions has a positive effect on price discovery. This means that speculators, or large traders, have a substantially substantial impact on futures market prices.

Nardella (2007) provided an in-depth look into speculators in the cocoa futures market. As shown by Chen, Gau, and Liao (2014), speculators in a specific market positively impact the efficiency of price discovery. Nardella disproved the theory that speculators cause unfounded volatility to occur. A vector autoregressive (VAR) model was used to examine this volatility. The results showed that speculators simply reacted quicker to information regarding the market. They changed their position just before the overall market moved. Arora and Kumar (2013) studied the price discovery function of copper and aluminum futures in the India market via a Vector Error Correction Model (VECM). They found that the futures market had the most efficient price discovery. This supports the lead-lag relationship commonly found between the futures and spot markets, wherein the futures market is quicker to absorb new relative information; this is correspondingly reflected in the commodity price. This is supported by the fact that it is cheaper to invest in the futures market. With the understanding that a significant majority of price discovery happens in the futures market, and that speculators in other commodity markets have substantial influence on price, we will focus on the impact managed money has in the Cocoa futures market. Commonly accepted principles from previous academic literature are applied and evaluated in this paper.

DATA AND METHODOLOGY

This project utilizes panel data on cocoa derivatives (futures and options) traded on the Intercontinental Exchange. The data is composed of price data downloaded from Investing.com (2017) and contract positions disseminated from the Commodity Futures Trading Commission (CFTC) report known as the

Commitment of Traders (COT) report (2016 and 2017). The COT report contains data on the position of market participants regarding their holding of long and short positions of futures, options and swaps in various commodity markets, including cocoa. It is released every Friday, with data representative of the previous Tuesday. Our data spans from June 2006 until November 2017, totaling 591 total weekly observations. One cocoa futures contract is for 10 metric tons, or 22,046 pounds, of cocoa beans (Cocoa Futures, 2018). The price is quoted in US dollars per metric ton. Cocoa beans are produced in numerous equatorial countries. The top five cocoa producing countries are listed in Table 1.

Table 1: Top 5 Cocoa Producing Countries, 2013 – 2017 (1,000 Metric Tons)

Country:	2013	2014	2015	2016	2017
Ivory Coast	1499	1746	1796	1581	2010
Ghana	835	897	740	778	950
Indonesia	410	375	325	320	290
Ecuador	192	234	250	232	270
Cameroon	225	211	232	211	240

Table 1 shows data from the top 5 cocoa producing countries as obtained from Statista (2018). The countries are listed in order of highest producing to lowest producing. The top country is Ivory Coast, producing approximately one third of global output annually. Their production can be seen increasing from 2013-2017. Indonesia, on the other hand, experienced a decrease in production. The remaining three countries had stable production levels.

As can be seen in Table 1, the five largest cocoa producing countries are Ivory Coast, Ghana, Indonesia, Ecuador, and Cameroon (Statista, 2018). Ivory Coast is by far the largest producer, producing approximately one third of global output annually. It is interesting to note that Ivory Coast production is increasing while the production of Indonesia is declining. Production from the other three producers, Ghana, Ecuador, and Cameroon, are relatively stable. Summary statistics of the panel data, including minimum, maximum, range, mean, and standard deviation, as well as open contracts, are listed in Table 2.

Table 2: Select Summary Statistics of Data Set (June 2006 – November 2017)

	Price	MM	PM	SW	OT
Range (Min to Max)	$1403 - 3703	-52334 - 83674	-109661 - 20667	5103 - 26109	-9629 - 23872
Mean	$2570.57	23842	-41172	9277	3412
Standard Deviation	$498.44	1107	29122	4392	5334
Open Contracts	N/A	73202	178763	29507	13798

Table 2 shows summary statistics including range – minimum to maximum - mean, standard deviation, and open contracts for Price, Managed Money (MM), Producer Merchant (PM), Swap Dealers (SW) and Other Reportables (OT) as the designated categories in the Commitment of Traders report.

As seen in Table 2, the range of cocoa prices was from $1403 to $3703, with a mean price of $2570. The range of net open contracts for MM is -52334 to 83674 with a mean number of 23,842 contracts. The standard deviation is 1107 contracts. The range of net open contracts for PM is -109661 to 20667 with a mean number of net contract position of -41,172. This is consistent with industry practice of PM buying the physical commodity and selling derivatives (cocoa futures and options) to hedge. The range of net open contracts for SW is 5103 to 26109 with a mean contract holding of 9,277 and standard deviation of 4,392. The range of net positions for OT is -9629 to 23872 with a mean of 3412 and standard deviation of 5,334. In this research, we utilize the net position of each of the four groups reported: Producers and Merchants, Managed Money, Swap Dealers and Other Reportables. The net position is calculated by taking the difference between the long and short position. The regression model is specified as follows.

$$Price = \alpha - \beta_1 PM + \beta_2 MM + \beta_3 SW + \beta_4 OT + P_{t-1} + e_t \quad (1)$$

where:

PM = Producer / Merchant

MM = Managed Money

SW = Swap Dealers
OT = Other
P_{t-1} = Price lagged one period (one week)
e_t = Error term

Additionally, the following regression variations, Equations 2 through 6, are tested to determine select market participants' impact on price.

$$Price = \alpha - \beta_1 PM + \beta_2 MM + \beta_3 SW + \beta_4 OT + e_t \quad (2)$$

$$Price = \alpha - \beta_1 PM + e_t \quad (3)$$

$$Price = \alpha + \beta_2 MM + e_t \quad (4)$$

$$Price = \alpha + \beta_2 MM + P_{t-1} + e_t \quad (5)$$

$$Price = \alpha + \beta_3 SW + e_t \quad (6)$$

The PM group is in the market as a hedger and therefore is expected to generally be in a sell position, hence the negative sign on $\beta_1$in Equations 2 and 3. For example, specifically in the cocoa derivatives markets, a PM might be a chocolate company that buys cocoa beans to process in to its final chocolate and confectionary products. This company likely buys physical cocoa beans, then sells an equivalent tonnage worth of contracts in cocoa derivatives (futures or options) to hedge their price risk. The CFTC describes them as "an entity that predominantly engages in the production, processing, packing or handling of a physical commodity and uses the futures markets to manage or hedge risks associated with those activities." That could be a cooperative that buys beans from farmers and ships toward end users, as well as intermediate processors and end users. MM, on the other hand, is involved in the market to speculate and make a profit. According to the CFTC, they are "a registered commodity trading advisor (CTA); a registered commodity pool operator (CPO); or an unregistered fund identified by the CTFC." This group includes hedge funds, exchange traded funds and managed futures. SW participate in the derivative markets with a different twist on how to manage risk. Typically, one firm buys a fixed price contract to be swapped for a floating price contract. One trader is long, the other is short. They are "an entity that deals primarily in swaps for a commodity and uses the futures markets to manage or hedge the risk associated with those swap transactions", according to the CFTC. OT market participants who are not classified as PM, MM, or SW dealers fall into the OT category.

Our expectation, as can be seen in the regression model, is that the PM variable will have a negative impact on price. Further, our expectation is that MM will have either a positive or negative impact on price depending on the underlying market conditions. SW and OT should have a positive impact on price given the nature of their involvement and arbitrage in the market. Our hypothesis follows that MM will be a significant variable and the coefficient will be significantly different from zero.

Null Hypothesis $H_0: \beta_2 = 0$

Alternative Hypothesis $H_a: \beta_2 \neq 0$

Our expectations are as follows regarding selected time periods: 2006 - 2017, 12/2006 - 1/2008, 2011, 6/2013 - 10/2014, and 1/2016 - 1/2017.
From 2006 - 2017, PM will be significant and likely negative. MM will be indeterminate and significant. SW and OT will likely be positive and significant but have next to no impact on R^2.

December 2006 to January 2018 was selected because it was a period of substantial price appreciation. Our expectations are that MM will be positive and PM will be negative.

Weeks 2/1 through 11/29 of the year 2011 were selected because it was a period of substantial price depreciation. Our expectations are that MM will be negative and PM will be negative.

June 2013 to October 2014 was selected because it was a period of substantial price appreciation. Our expectations are that MM will be positive and PM will be negative.

January 2016 to January 2017 was selected because it was a period of substantial price depreciation. Our expectations are that MM will be negative and PM will be negative.

RESULTS AND DISCUSSION

The results of regressions from the entire time range, June 2006 to November 2017, are detailed in Table 3.

Table 3: Regression Results from 2006-2017

Regression	P/M	MM	SW	OT	P_{t-1}	R^2	Adj R^2
1	-0.00067	-0.00037	0.00082	0.0011	0.97***	0.960	0.959
2	0.043***	0.052***	0.0071***	0.084***		0.359	0.355
3	-0.007***					0.181	0.179
4		0.0063***				0.114	0.113
5		0.00024			0.978***	0.959	0.959
6			0.023***			0.040	0.038

*Table 3 shows regression results for the entire data set from 2006 – 2017. Significant regressions to examine include Regression 1, Regression 2, and Regression 4. Regression 1 shows that only lagged price is significant while none of the COT variables have a significant impact on price. Regression 2 shows that with lagged price excluded, each of the COT variables are significant but $R^2 = 0.355$. Regression 4 shows that MM is significant at the 99 percent level but R^2 is only 0.11. ***, **, and * represent significance at the 1, 5, and 10 percent levels, respectively.*

As can be seen in Table 3, regression 1 shows results for all variables, including price lagged one period. The only significant variable is P_{t-1}. PM, MM, SW and OT all have coefficients that are not significantly different from zero. Regression 2 includes all four market participant groups without lagged price. They are all significant at the 99 percent level, but the adjusted R^2 is relatively low at 0.355. Only the PM group is tested in Regression 3. The coefficient of -0.007 is significant with an R^2 of 0.181. In Regression 4, MM is significant with an R^2 of only 0.114. With the inclusion of P_{t-1} in Regression 5, MM becomes insignificant, while P_{t-1} is significant with an R^2 of 0.959. Regression 6 examines SW influence on the market, finding that it is significant at the 99 percent level with a very small R^2 of 0.040. When analyzing the entire data period, no one independent variable stands out as a driver of price. However, one should note that both PM and MM are singularly significant. PM's slightly higher R^2 makes sense, since this group is always in the market managing risk. MM does not have to be in this market and likely participates little until an event occurs, such as migrant labor problems in Ivory Coast, civil unrest, geopolitical disturbance in one of the larger producing countries, etc. To further examine participants' impact on the market during a time of substantial increase in price, we select data from December 2006 to January 2006. This totaled fifty-eight observations. Table 4 shows regression results from this selected period.

Table 4: Regression Results from December 2006-January 2008

Regression	P/M	MM	SW	OT	P_{t-1}	R^2	Adj R^2
1	-0.00305	0.0000019	-0.0072	-0.0074	.743***	0.859	0.845
2	-0.012	-0.00381	-0.026	0.018		0.594	0.563
3	-0.0085***					0.337	0.326
4		0.010***				0.423	0.413
5		0.0034***			0.791***	0.851	0.845
6			-0.016***			0.148	0.133

*Table 4 shows regression results for the selected period of 12/2006-1/2008. Regression 1 shows the only significant variable is lagged price. Regression 3 confirms our expectations that P/M is negative during a period of price appreciation; it is significant with an R^2 of 0.326. Regression 4 shows that MM is significant with an R^2 of 0.423. Inclusion of price lagged one period increases R^2 to 0.845, as seen in Regression 5. ***, **, and * represent significance at the 1, 5, and 10 percent levels, respectively.*

In Table 4, Regression 1, results are similar to those of Table 3, Regression 1. None of the COT variables are significant. Only P_{t-1} shows significance at the 99 percent confidence level. Regression 2 finds that none of the COT variables are significant. Regression 3, however, examines solely Producers/Merchants. Consistent with expectations during a period of price increases, the PM coefficient was negative and significant at the 99 percent level. Regression 4 determines that MM was positive and significant at the 99 percent level with R^2 of 0.423. By including P_{t-1} to MM in Regression 5, both variables are significant with an R^2 of 0.845. SW has a negative and significant impact; the R^2 is 0.148. Table 5 shows regression results from February 2, 2011 to November 29, 2011, a time of price decline. There were forty-four observations in this section.

Table 5: Regression Results from 2011

Regression	P/M	MM	SW	OT	P_{t-1}	R^2	Adj R^2
1	-0.041**	-0.037*	-0.036*	-0.070**	0.553***	0.912	0.900
2	-0.047*	-0.037	-0.028	-0.060		0.792	0.771
3	-0.015***					0.784	0.779
4		0.0261***				0.752	0.747
5		0.0113***			0.562***	0.897	0.891
6			0.0787***			0.662	0.654

*Table 5 shows regression results for the 2011 calendar year. Regression 1 shows that all variables are significant with an R^2 of 0.900. In Regression 4, MM by itself is significant with an R^2 of 0.752. With the addition of lagged price in Regression 5, MM remains significant at the 99 percent level, and R^2 improves to 0.891. ***, **, and * represent significance at the 1, 5, and 10 percent levels, respectively.*

In Table 5, we can see the results of Regression 1 that all variables are significant at varying levels with an adjusted R^2 of 0.900. By removing the lagged price variable in Regression 2, only PM remains statistically significant at the 90 percent level. R^2 drops to 0.771. PM stands alone with a significant coefficient and R^2 of 0.784 in Regression 3. In Regression 4, the MM coefficient, 0.0261, is significant at the 99 percent level of confidence with an R^2 of 0.752. When P_{t-1} is added in Regression 5, both variables are significant that the 99 percent level of confidence with an improved R^2 of 0.891. Regression 6 shows that SW is significant at the 99 percent level with an R^2 of 0.662. Table 6 shows regression results from the selected time period of June 2013 to October 2014. There were seventy-three observations.

Table 6: Regression Results from June 2013-October 2014

Regression	P/M	MM	SW	OT	P_{t-1}	R^2	Adj R^2
1	-0.0166**	-0.0153**	-0.0234***	-0.0011	0.772***	0.954	0.951
2	-0.0440***	-0.0372**	-0.0742***	0.0105		0.780	0.766
3	-0.0094***					0.266	0.256
4		0.0132***				0.298	0.288
5		0.00162*			0.947***	0.940	0.938
6			-0.0250***			0.104	0.091

*Table 6 shows regression results for the selected period of 6/2013-10/2014. In each regression equation, MM is significant during this time period. MM only in Regression 4 is significant with an R^2 of 0.298. The inclusion of price lagged onetime period significantly increases R^2 to 0.938, although MM is significant at only the 90 percent level. ***, **, and * represent significance at the 1, 5, and 10 percent levels, respectively.*

All variables except OT are significant in Regression 1, with an R^2 of 0.951. PM, MM, and SW remain statistically significant with the removal of P_{t-1} in Regression 2. This R^2 is 0.766. Regression 3 looks at the impact of PM alone. It finds it to be significant at the 99 percent level with the R^2 of 0.266. In Regression 4, which is singularly MM, it is significant at the 99 percent level of confidence with an R^2 of 0.298. In Regression 5, MM is significant at the 90 percent level of confidence due to the inclusion of P_{t-1}. The R^2 is substantially higher at 0.938. Swaps are significant in Regression 6, but with a minimal R^2 of 0.104. We see in this table that in Regressions 1, 2, 4, and 5, MM is significant in each one. The results of regressions from the selected time period January 2016 to January 2017 are detailed in Table 7. This period of price decline examines fifty-five observations.

Table 7: Regression Results from January 2016-January 2017

Regression	P/M	MM	SW	OT	Pt-1	R2	Adj R2
1	0.0117**	0.0160***	0.0090*	0.0140**	0.514***	0.920	0.912
2	0.0213***	0.0282***	0.0179***	0.0233***		0.858	0.846
3	-0.0063***					0.411	0.400
4		0.0081***				0.787	0.783
5		0.00433***			0.584***	0.904	0.901
6			-0.00096			0.000934	-0.0178

*Table 7 shows regression results for the selected period of 1/2016-1/2017. In Regression 2, every variable is statistically significant. The R^2 is 0.846. In Regression 4, MM only, it is significant with an R^2 of 0.787. When price lagged one week is included in Regression 5, MM remains significant at the 99 percent level, with the R^2 improving to 0.901. ***, **, and * represent significance at the 1, 5, and 10 percent levels, respectively.*

Regression 1 tests all variables and finds that they are all significant at varying levels with an adjusted R^2 of 0.912. In Regression 2, each variable is significant at the 99 percent level of confidence with a high R^2 of 0.846. PM are significant on their own with a negative coefficient. The R^2 for Regression 3 is 0.411. In Regression 4, MM is significant at the 99 percent level with an R^2 of 0.787. When P_{t-1} is added in Regression 5, MM remains significant at the 99 percent level of confidence and the R^2 rises to 0.901. We see in Regression 6 that SW have no significant impact on the market during this period.

CONCLUDING COMMENTS

The focus of this research project was to show that MM, hedge funds, play a significant role in price determination in cocoa derivatives markets. Weekly data of the positions of PM, MM, SW, and OT were obtained from the Commitment of Traders (COT) Report and sequenced to price data from Investing.com. A regression equation model was tested on the whole data set, as well as selected time periods of price increases and decreases. This research clearly shows that MM is a significant explanatory variable for cocoa price. Based on the regression results, we can reject the null hypothesis and assert that MM does have a significant impact on cocoa price in each of the specific time periods, as well as the entire time. Interestingly, during select time periods of price increases MM was significant and had a higher R^2 that PM. During periods of cocoa price decreases PM and MM were both significant but with indeterminant impacts on R^2. Hedge funds are instrumental in moving price higher during periods of contango for cocoa prices. Hedge funds are not participating out of a risk management need like PM or SW, but rather are taking risk as a profit-making opportunity. They potentially facilitate a legitimate role through arbitrage and liquidity. They significantly move the market in either direction, long or short, simply by their presence. This could warrant policy formulation and implementation regarding hedge fund activity in commodity derivatives from the CFTC, Federal Reserve, or Congress. Regarding the data from the CFTC, from a research data quality and industry point of view, it would be optimal if this data were reported with greater frequency rather than weekly. Daily reporting and streamlined release would be an improvement for industry understanding. It would also provide better analytic opportunities for research. Likely, it would increase costs of reporting and dissemination.

As commodities futures prices rise, increased margin requirements or margins calls may occur. This research suggests that hedge funds contribute to price increases and subsequent increased capital requirements. This poses a question: what is the increase in risk for PM, SW, and OT firms? They either must increase capital outlays for risk management to maintain their number of contracts to hedge, or they must reduce the number of contracts to stay in the risk management budget. The latter option can force the firm to have fewer than necessary contracts hedged. This increases risk to the firm from the unhedged portion of inventory. As a future research project, it would be interesting to look at speculation and increased price, subsequent increases in margin requirements and changes in risk management strategies. From this project, we determined that hedge funds move the cocoa market up and down. Moves happen more dramatically to the upside. It will be interesting to learn what other markets have the same occurrence.

REFERENCES

Arora, S., and N. Kumar (2014) "Role of futures market in price discovery," Indian Institute of Management Calcutta, vol. 40(3), p. 166-179. doi:10.1007/s40622-013-0019-8

Brandt, M.W., Kavajecz, K.A. and S.E. Underwood (2007) "Price Discovery in the Treasury Futures Market," The Journal of Futures Markets, vol. 27(11), p. 1021-1051. doi:10.1002/fut.20275

Chen, Y., Gau, Y., and W. Liao (2014) "Trading activities and price discovery in foreign currency futures markets," Springer Science Business Media New York, vol. 46(4), p. 794-818. doi:10.1007/s11156-014-0486-9

Cocoa Futures. (2018). Retrieved from https://www.theice.com/products/7/Cocoa-Futures

Garbade, K.D. and W.L. Silber (1983) "Price Movements and Price Discovery in Futures and Cash Markets," The Review of Economics and Statistics, vol. 65(2), p. 289-297. doi: 10.2307/1924495.

Investing.com (2017, November 21). US Cocoa Futures Historical Data [Data set]. Retrieved from https://www.investing.com/commodities/us-cocoa-historical-data

Nardella, M. (2007). Price efficiency and speculative trading in cocoa futures markets. In Agricultural Economics Society 81st Annual Conference Proceedings (p. 600-604). United Kingdom: Agricultural Economics Society.

New York Board of Trade. (2004). Cocoa Futures and Options [PDF file]. Retrieved from http://tradesofts.net/sitebuildercontent/sitebuilderfiles/cocoabrochure.pdf

Statista. (2018). World cocoa production by country from 2012/2013 to 2016/2017 (in 1,000 metric tons) [Data set]. Retrieved from https://www.statista.com/statistics/263855/cocoa-bean-production-worldwide-by-region/

Tornell, A., and C. Yuan (2012) "Speculation and Hedging in the Currency Futures Markets: Are They Informative to the Spot Exchange Rates," The Journal of Futures Markets, vol. 32(2), p. 123-151. doi:10.1002/fut.20511

U.S. Commodity Futures Trading Commission. Disaggregated Explanatory Notes. Washington, DC: CFTC. Retrieved from https://www.cftc.gov/MarketReports/CommitmentsofTraders/DisaggregatedExplanatoryNotes/index.htm

U.S. Commodity Futures Trading Commission. (2016, February 4). Disaggregated Futures-and-Options Combined Reports: 2006-2016 [Data set]. Retrieved from https://www.cftc.gov/MarketReports/CommitmentsofTraders/HistoricalCompressed/index.htm

U.S. Commodity Futures Trading Commission. (2017, December 28). Disaggregated Futures-and-Options Reports: 2017 [Data set]. Retrieved from https://www.cftc.gov/MarketReports/CommitmentsofTraders/HistoricalCompressed/index.htm

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RISK AND RETURN DETERMINANTS OF US INSURERS

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ABSTRACT

This paper identifies the risk and risk-adjusted return determinants of US insurers. We find that the significant firm-specific determinants for risk and risk-adjusted return vary slightly for the risk proxy and risk-adjusted return proxy used, and the types of insurers. We find that in general, profitability, leverage, types of management compensation are significantly related to both total risk and systematic risk; in addition, size is positively related to systematic risk. Profitability and incentive pay are significant determinants for total-risk-adjusted return. Size is significantly negatively related to systematic-risk-adjusted return. In addition to size, profitability and leverage are significant determinants for systematic-risk-adjusted return for Life insurers.

JEL: G22

KEYWORDS: Firm-Specific Risk Determinants, Firm-Specific Risk-Adjusted-Return Determinants, Insurance Industry, Executive Compensation, Stock Exchange

INTRODUCTION

Firms' risk determinants have been widely studied. Many studies focused on identifying the determinants of systematic risk (e.g., Iqbal and Shah, 2012, Voulgaris and Rizonaki, 2011, Lee and Jang, 2007, and Huffman, 1989); while others examined the determinants of both systematic and total risk (e.g., Eling and Marek, 2012, and Borde, Chambliss and Madura, 1994). The majority of these studies examined non-insurer's risk determinants. Only a few researchers have studied the determinants of insurers' systematic risk and total risk (e.g., Eling and Marek, 2012, and Borde, Chambliss and Madura, 1994); few have studied the determinants of insurer's risk-adjusted return. Risk studies for insurers heavily focused on identifying firm-specific factors that help predict insurer's financial distress and insolvency. (e.g., Zhang and Nielson, 2015, Sharpe and Stadnik, 2007, Brockett et al, 2006, Chen and Wong, 2004, Baranoff, Sager, and Shively, 2000, Carson and Hoyt, 2000, and Carson and Hoyt, 1995)

Equally important are the insurer's risk and performance as reflected in the stock price volatility, systematic risk, and risk-adjusted return. Traditional finance theory asserts that only systematic risk is compensated with risk premium. However, not all investors can completely diversify risk and obtain full information at low/zero cost; this fact, combined with the indivisibility of investment units, means that total risk is still pertinent to stock returns. Harrington (1983) found that US Life insurers' mean return was significantly related to measures of unsystematic risk, indicating that unsystematic risk was rewarded within the insurance industry. Cummins and Harrington's (1988) empirical results showed that unsystematic risk was significantly related to US property and liability insurers' returns during the period 1970-1980.

The purpose of this paper is to study how insurers' firm-specific financial features and executive compensation structures are related to firms' risk level and risk-adjusted return, while controlling for the

major stock exchange listed and the types of insurance business. Our paper supplements the previous risk identification literature for US insurers that typically focused on insolvency prediction by extending the study scope to examining factors influencing insurer's risk level and risk-adjusted return. The remainder of the paper is organized as follows: next section provides a brief literature review, followed by methodology and data, and empirical results sections. The conclusions appear in the final section.

LITERATURE REVIEW

Managerial decisions about operation, growth, financing and executive compensation, as well as the major line of insurance business, influence an insurer's overall performance and how its return interacts with the market return. This implies that firm-specific variables can explain a significant share of variations in risk and return. Many key aspects of a firm's financial features have been found being related to firm risk and/or to stock performance in prior studies. (e.g., Eling and Marek, 2012, Dong, Wang, and Xie, 2010, Baranoff, Sager and Shively, 2000, Carson and Hoyt, 1995, and Borde, Chambliss and Madura, 1994). The major stock exchange on which an insurer is traded may be related to return volatility. Dodd (2012) found that firms on the smaller over-the-counter market exhibited more problems with thin trading. Borde, Chambliss and Madura (1994) studied how the firm-specific financial factors affect insurers' risk measured by the standard deviation of stock return and Beta over a four-year period. Based on the sample of US insurers during the period 1988-1991, they found that factors influencing insurers' risk are conditioned on the proxy used to measure risk and the type of insurer assessed. They found a positive relationship between leverage and risk in the entire sample and in the Life/Health insurer sub-sample, but negative for Property/Casualty insurer sub-sample. Liquidity was related to risk, but its effect on systematic risk and total risk was not consistent. Growth in premium was found to be positively related to total risk for the entire sample and for the P/C insurer sub-sample.

Eling and Marek (2012) studied the role of firm-specific and environmental factors in the risk level of European insurers during the period 1997-2010. Their risk measures were stock return volatility and Beta. They found that the market-based UK corporate governance system exhibited a higher level of risk, while the control-based regime model in Germany exhibited lower risk. They also found that the significant risk determinants vary with the risk proxy used and the types of insurance business. In general, they found that liquidity is negatively related to total risk, but not systematic risk; and that size is positively related to both systematic risk and total risk. In other industries, the relationship between firm-specific factors and risk measures based on stock return is widely examined. For example, Lee and Jang (2007) found that US airlines' Betas were positively related to debt leverage and size, while negatively related to profitability, growth and safety during the period 1997-2002. Voulgaris and Rizonaki (2011) analyzed the effect of operating and financial features such as profitability, liquidity, dividend payout, size and growth on systematic risk (Beta) for Greek listed firms after Greece's entrance into the European Monetary Union. They found that the degrees of financial and operating advantage, the interest coverage ratio, the growth in total assets and dividend payout ratio helped explain variations in Beta.

The effects of firm-specific characteristics on the risk-adjusted return for US insurers has been rarely studied, even though risk-adjusted return measures, e.g., Sharpe ratio and Treynor ratio, are widely used in the portfolio performance evaluation literature and in industry practice to measure how well an investment has compensated its investors given its level of risk. (e.g., Bodie, Kane and Marcus, 2005, Reilly and Norton, 2003, Sharpe, Alexander and Bailey, 1999, Sharpe, 1994, Alexander and Francis, 1986, Sharpe, 1966, and Treynor, 1965) The Sharpe ratio, developed by Nobel laureate William F. Sharpe (Sharpe, 1966), is the ratio of the return earned in excess of the risk-free rate to the standard deviation of the stock returns. In other words, the Sharpe ratio is a risk-adjusted measure of return based on total risk. The Sharpe ratio indicates whether the stock's returns are due to good management or result from excess risk. The Treynor ratio, developed by Jack Treynor (Treynor, 1965), measures return earned in excess of the risk-free rate per unit of market risk. In other words, the Treynor ratio is a risk-adjusted measure of return based on

systematic risk. For both ratios, a higher numerical value indicates a better risk-adjusted return. Both ratios measure how well an investment has compensated investors given its level of risk.

METHODOLOGY AND DATA

Based on above review, the two traditional risk measures (standard deviation of stock return and CAPM Beta) and two risk-adjusted return measures (Sharpe ratio and Treynor ratio) are employed as dependent variables. The risk determinants considered as independent variables in the empirical models are discussed below. The overall profitability is measured by return on equity. If high profitability is due to superior operating performance, a company with strong profitability improves its financial stability thereby inducing less uncertainty and investor doubt (Gu and Kim, 2002). Hence, we expect insurers with high profitability exhibit lower risk and higher risk-adjusted return (operating efficiency hypothesis). Leverage is measured by liability-to-asset ratio. High leverage reduces a company's ability to meet future obligations and magnifies that insurer's returns or losses. Hence, increases the risk level (Shim, 2010, and Lee and Jang, 2007). Meanwhile, high leverage is likely related to more growth opportunity and may result in higher profitability. If such higher profitability is sufficient to compensate for higher risk, leverage should be positively related to risk-adjusted return.

Liquidity is measured by current ratio. More liquid firms have a better cushion against risk, thus we expect a negative relationship between liquidity and risk (Moyer and Chatfield, 1983). However, high liquidity may suggest inefficient use of capital, since highly liquid assets, such as cash, usually generate lower returns. If the benefit of lower risk is outweighed by the downside of lower return, the risk-adjusted return will be negatively related to liquidity; otherwise, positively related to liquidity. Business growth is measured by the percentage change in net premium earned. Firms with higher business growth exhibit a higher level of underwriting risk, especially if the high growth is due to lower underwriting discipline. Prior research has observed a positive relationship between business growth and risk (Miles, 1986). However, if high premium income improves cash-flow performance and if the cash-flows are invested well, insurers' return could be improved to overcome the increased risk; hence, business growth can be positively related to the risk-adjusted return. (Pottier and Sommer, 1999)

The common logarithm of assets is used as the proxy for insurer size. Because of possible economies of scale, less volatile claim costs, and a stronger ability to raise capital, large insurers are expected to have lower risk (Titman and Wessels, 1988). For these same reasons, large firms are expected to have higher risk-adjusted return. According to agency theory, compensation based on performance and deferred compensation may encourage management to pursue a more sustainable operating strategy that results in optimal risk taking and improved risk-adjusted return. On the other hand, management compensation in stock options could increase the risk-taking incentive, thereby increasing the underlying stock return volatility (Low, 2009, Chen, Steiner and Whyte, 2006, and Grace, 2004). The increased risk may or may not lead to improved risk-adjusted return ratio. Performance-based compensation, deferred compensation and stock options are expressed as percentages of total compensation. (Our definition of performance-based compensation includes items such as bonus, long term incentive plan payout, restricted stock granted, etc., but excludes options.) The differences across New York Stock Exchange (NYSE) and other stock exchanges may also influence stock volatility. Insurers listed on NYSE receive more attention from analysts, which results in lower stock volatility. Our regression models control for the major stock exchange on which the insurer is traded. The different lines of insurance business have substantially different profiles with regard to the predictability of losses, the duration of the risks insured, and how investment vehicles are used to manage and hedge the insurance risks. A dummy variable is used in models applied to the entire sample in order to control for the risk differentials between Life insurers and Property/Casualty insurers.

Our sample includes Life insurers with North American Industry Classification System (NAICS) code 524113, and Property/Casualty insurers with NAICS code 524126. Accounting data/variables over the

period 1992-2011 were retrieved from Compustat. Stock return, standard deviation of stock returns, and Beta were drawn from Center for Research in Security Prices (CRSP). Merging the data from Compustat and CRSP produced a sample of 722 insurer-year listwise observations, 156 observations for Life insurers and 566 for property and casualty insurers. (The numbers of observations in models with different dependent variables are not the same and differ from the reported 722 listwise observations in table 1, due to the missing data in some dependent variables. For example, if an observation's standard deviation of stock return value is missing but beta value is available, this observation is not included in table 1, but still in systematic risk measure regression model.) Due to the 20-year sample period, we use a time-fixed effects OLS regression method to test the following empirical models: The model for the entire sample is as follow:

$$Dependent\ variable = \alpha_0 + \alpha \bullet X + \mu \bullet exchange\ listed + \theta \bullet type\ of\ insurer \quad (1)$$

The model for sub-samples of each type of insurer is as follow:

$$Dependent\ variable = \alpha_0 + \alpha \bullet X + \mu \bullet exchange\ listed \quad (2)$$

Four dependent variables are tested separately. X is the vector of the independent variables as discussed above.

We also tested our empirical models based OLS regression. Even though the results from both regressions are similar, time-fixed effects OLS regression surpasses OLS regression in many ways: firstly, many year dummies in time-fixed effects OLS regressions are statistically significant and the adjusted R-squares are improved. Time-fixed effects regression captures the temporal difference resulting from the long sample period. Secondly, more independent variables become statistically significant.

EMPIRICAL RESULTS

Table 1 provides variable means and the one-way ANOVA F-test results of the study sample. Based on univariate one-way ANOVA test, Life and P/C insurers are significantly different in the following aspects: On average, Life insurers have higher CAPM Beta, Liability-to-Asset Ratio, Current ratio, size, Incentive Pay Ratio, and Option Granted Ratio. More Life insurers are listed on NYSE. Meanwhile, P/C insurers have higher Net Premium Earned Growth Rate. We observe no significant differences in Standard Deviation of Stock Return, Sharpe Ratio, Treynor Ratio, Return on Equity, and Deferred Compensation Ratio between the insurance industries.

Tables 2 through 4 report firm-specific variables' effects for the combined P/C and Life insurers sample, P/C insurers only sample, and Life insurers only sample respectively. The F-tests show that the regressions are significant for all models. Our models explain between 46.5% and 78.7% of variation in stock return volatility, 31.5%-67.2% in Beta, 50.3%-61.3% in Sharpe ratio, and 28.5%-37.8% in Treynor ratio. All four models explain a significant portion of the variation in the dependent variables across insurers. The time-fixed effects regression models include 19 year dummies in total, many of which are statistically significant. Estimates of the time dummy variables are not reported due to the space limitations. These results are available upon request. Variance Inflation Factors (VIF) values are reported. We observe no variables with VIF higher than the problematic value of 10.

Table 1: Variable Means For P/C and Life Insurers with Univariate One-Way ANOVA Test Results

Variable	Types	Mean	ANOVA F-Test Sig
Standard Deviation of Stock Return	P/C	0.0223	0.939
	Life	0.0222	
CAPM Beta	P/C	0.9399	0.000***
	Life	1.1455	
Sharpe Ratio	P/C	5.9211	0.442
	Life	7.0054	
Treynor Ratio	P/C	0.1251	0.602
	Life	0.0971	
Return on Equity	P/C	0.0815	0.418
	Life	0.1000	
Liability-to-Asset Ratio	P/C	0.7489	0.000***
	Life	0.8918	
Current Ratio	P/C	15.1577	0.000***
	Life	30.2625	
NPE Growth Rate	P/C	0.0996	0.005***
	Life	0.0400	
Size	P/C	4.0536	0.000***
	Life	4.5518	
Incentive Pay Ratio	P/C	0.2520	0.062*
	Life	0.2886	
Deferred Compensation Ratio	P/C	0.0617	0.108
	Life	0.0511	
Option Granted Ratio	P/C	0.1653	0.019**
	Life	0.2111	
NYSE	P/C	0.77	0.000***
	Life	0.92	

*(P/C Insurers N=566, Life Insurers N=166). Table 1 provides variable means and the one-way ANOVA F-test results of the P/C and Life insurers. ***Significant at 1%, **Significant at 5%, *Significant at 10%*

Return on equity (ROE) is negatively related to both standard deviation of stock return (total risk) and CAPM Beta (systematic risk); ROE is positively related to Sharpe Ratio (total-risk-adjusted return) for all three samples; and ROE is positively related Treynor Ratio (systematic-risk-adjusted return) only for the Life insurer sample. Our finding supports the operating efficiency hypothesis that insurers' high profitability is due to superior operating performance, which improves its financial stability thereby reduces the risk, and provides better risk-adjusted return.

Insurers' liability-to-asset ratio is positively related to standard deviation of stock return and CAPM Beta for the full insurer sample and for P/C insurer sample; however, it is not significant for Life insurer sample when examined separately. This result confirms the hypothesis that leverage increases insurers' risk level. Liability-to-asset ratio is only significantly positively related to Life insurers' Treynor ratio, which is the measure for systematic-risk-adjusted return; this may suggest Life insurers' high profitability resulting from high leverage is sufficient to compensate the systematic risk.

Table 2: The Effects of Firm-Specific Variables—All Insurers Sample (P/C and Life Insurers)

	Standard Deviation of Stock Return			CAPM Beta			Sharpe Ratio			Treynor Ratio		
	Coef.	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**
Constant		0.79			0.02			0.00			0.00	
Return On Equity	-0.188***	0.00	1.096	-0.309***	0.00	1.093	0.049*	0.07	1.096	0.035	0.29	1.096
Liability-to-Asset Ratio	0.214***	0.00	1.738	0.065*	0.10	1.739	-0.023	0.49	1.746	-0.005	0.90	1.750
Current Ratio	0.002	0.94	1.074	-0.003	0.92	1.078	-0.018	0.51	1.074	-0.020	0.54	1.078
Net Premium Earned Growth Rate	-0.024	0.40	1.130	-0.003	0.93	1.137	0.007	0.81	1.126	0.026	0.43	1.128
Size	-0.036	0.32	1.941	0.148***	0.00	1.950	-0.045	0.21	1.942	-0.076*	0.08	1.937
Incentive Pay Ratio	0.076*	0.07	2.619	0.201***	0.00	2.623	0.110***	0.01	2.598	0.043	0.39	2.632
Deferred Compensation Ratio	0.055*	0.05	1.157	0.045	0.16	1.162	0.005	0.86	1.154	0.044	0.20	1.156
Option Granted Ratio	0.083*	0.06	2.839	0.289***	0.00	2.852	0.032	0.46	2.833	0.001	0.99	2.877
NYSE	-0.117***	0.00	1.270	0.087***	0.01	1.260	0.021	0.46	1.273	-0.041	0.25	1.268
Life	-0.026	0.39	1.325	0.089***	0.01	1.336	0.034	0.25	1.329	0.011	0.76	1.338
	N=735			N=745			N=730			N=726		
	Adjusted R Square=0.504			Adjusted R Square=0.351			Adjusted R Square=0.519			Adjusted R Square=0.285		
	F=26.683 Sig.=0.000			F=14.897 Sig.=0.000			F=28.110 Sig.=0.000			F=10.964 Sig.=0.000		

*Tables 2 shows the regression estimates of the equation "Dependent variable=constant+α•X +μ•exchange listed + θ•type of insurer" for the combined P/C and Life insurers sample. The four dependent variables tested separately are standard deviation of stock return, CAPM Beta, Sharpe Ratio and Treynor Ratio. X is the vector of the independent variables as listed in the first column. Standardized coefficients are reported. *** Significant at 1%, **Significant at 5%, *Significant at 10%*

Table 3: The Effects of Firm-Specific Variables—P/C Insurers Only Sample

	Standard Deviation of Stock Return			CAPM Beta			Sharpe Ratio			Treynor Ratio		
	Coef.	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**
Constant		.79			.03			.00			.000	
Return On Equity	-0.208***	0.00	1.098	-0.355***	0.00	1.096	0.055*	0.08	1.098	0.032	0.39	1.099
Liability-to-Asset Ratio	0.223***	0.00	1.393	0.083**	0.04	1.396	-0.025	0.48	1.401	-0.010	0.82	1.402
Current Ratio	0.026	0.41	1.053	0.020	0.57	1.054	-0.022	0.46	1.054	-0.039	0.28	1.050
Net Premium Earned Growth Rate	-0.039	0.25	1.198	-0.004	0.92	1.211	0.005	0.88	1.193	0.015	0.70	1.196
Size	-0.062	0.12	1.676	0.111**	0.01	1.677	-0.047	0.22	1.681	-0.070	0.12	1.683
Incentive Pay Ratio	0.119**	0.02	2.758	0.258***	0.00	2.750	0.108**	0.03	2.738	0.018	0.76	2.747
Deferred Compensation Ratio	0.068**	0.04	1.161	0.043	0.24	1.164	0.001	0.98	1.157	0.043	0.26	1.158
Option Granted Ratio	0.121**	0.02	2.921	0.353***	0.00	2.934	0.013	0.80	2.909	-0.036	0.55	2.918
NYSE	-0.107***	0.00	1.230	0.119***	0.00	1.221	0.018	0.58	1.232	-0.053	0.18	1.230
	N=577			N=583			N=573			N=569		
	Adjusted R Square=0.465			Adjusted R Square=0.315			Adjusted R Square=0.503			Adjusted R Square=0.296		
	F=18.915 Sig.=0.000			F=10.567 Sig.=0.000			F=21.652 Sig.=0.000			F=9.550 Sig.=0.000		

*Tables 3 shows the regression estimates of the equation "Dependent variable=constant+α•X +μ•exchange listed" for P/C insurers sample. The four dependent variables tested separately are standard deviation of stock return, CAPM Beta, Sharpe Ratio and Treynor Ratio. X is the vector of the independent variables as listed in the first column. Standardized coefficients are reported. *** Significant at 1%, **Significant at 5%, *Significant at 10%*

Table 4: The Effects of Firm-Specific Variables—Life Insurers Only Sample

	Standard Deviation of stock return			CAPM Beta			Sharpe Ratio			Treynor Ratio		
	Coef.	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**
Constant		0.97			0.20			0.60			0.53	
Return On Equity	-0.249***	0.00	1.852	-0.207***	0.00	1.821	0.128*	0.06	1.850	0.196**	0.02	1.852
Liability to Asset Ratio	0.079	0.24	3.268	0.077	0.34	3.161	0.059	0.51	3.264	0.242**	0.03	3.167
Current Ratio	0.003	0.94	1.386	-0.008	0.88	1.402	-0.022	0.71	1.387	-0.085	0.26	1.424
Net Premium Earned Growth Rate	-0.029	0.45	1.107	-0.054	0.26	1.104	-0.002	0.96	1.110	0.096	0.15	1.107
Size	0.023	0.77	4.644	0.153	0.11	4.494	-0.055	0.61	4.640	-0.326**	0.02	4.487
Incentive Pay Ratio	-0.010	0.90	4.382	0.138	0.15	4.556	0.089	0.39	4.285	0.131	0.33	4.408
Deferred Compensation Ratio	0.009	0.85	1.566	0.104*	0.07	1.564	-0.023	0.71	1.565	-0.047	0.55	1.554
Option Granted Ratio	0.063	0.40	4.135	0.282***	0.00	4.283	0.018	0.86	4.168	0.061	0.64	4.286
NYSE	-0.048	0.39	2.290	0.066	0.33	2.270	0.028	0.72	2.289	0.084	0.37	2.161
	N=158			N=162			N=157			N=157		
	Adjusted R Square=0.787			Adjusted R Square=0.672			Adjusted R Square=0.613			Adjusted R Square=0.378		
	F= 21.681 Sig.= 0.000			F=12.806 Sig.= 0.000			F=9.819 Sig.= 0.000			F=4.386 Sig.= 0.000		

Current ratio and net premium earned growth rate are not significant for any dependent variables for either the entire sample or any of the subsamples. Size is significantly positively related to CAPM Beta for the all insurer sample and for the P/C insurer sample. Conversely, size is significantly negatively related to Treynor ratio for the all insurer sample and for the Life insurer sample. The results indicate that size has no impact on total risk, but does have an impact on systematic risk. Large insurers exhibit higher systematic risk and lower systematic-risk-adjusted return, which differs from our expectation. The positive relationship between size and systematic risk is also found in Lee and Jang's (2007) study with US airline industry, and Eling and Marek's (2012) study with UK and German insurers.

Three compensation ratios--incentive pay ratio, deferred compensation ratio and options granted ratio--are significantly positively related to standard deviation of stock return for the all insurer sample and for the P/C insurer sample. Incentive pay and option granted are significantly positively related to CAPM Beta for the all insurer sample and for the P/C insurer sample. Deferred compensation and option granted are significantly positively related to CAPM Beta for the Life insurer sample. The positive impact of options granted on both total and systematic risk is as expected, i.e., that stock options increase management's risk-taking incentive. Of the three compensation ratios, only incentive pay is significantly positive related to Sharpe ratio (which is the measure for total-risk-adjusted return) for all insurer sample and P/C insurer sample. This finding is consistent with our expectation that incentive pay encourages optimal risk taking, hence, helps to improve the total-risk-adjusted return.

The coefficient for NYSE is significantly negative for standard deviation of stock return model and significant positive for CAPM Beta model for all insurer sample and P/C insurer sample; and is not significant for Sharpe ratio and Treynor Ratio models. The finding indicates that insurers traded on NYSE exhibit lower stock volatility and high systematic risk, while the listing exchange has no impact on risk-adjusted return. In the entire sample model, the coefficient for Life insurers is positive for CAPM Beta model. The positive coefficients indicate that, when compared to P/C insurers, Life insurers exhibit higher systematic risk. This confirms our earlier univariate one-way ANOVA test result.

CONCLUSIONS

The paper identifies the risk and risk-adjusted return determinants of US insurers. We adopt standard deviation of stock return as the measure for total risk, and CAPM Beta as the measure of systematic risk; total-risk-adjusted return is measured by Sharpe ratio and systematic-risk-adjusted return is measured by Treynor ratio. Based on the sample observed for the period 1992-2011, we find that the significant firm-specific determinants for risk and risk-adjusted return vary slightly depending on the risk proxy and risk-adjusted return proxy used as well as the types of insurers. Overall, we find that total risk is negatively related to return on equity (profitability) and positively related to liability-to-asset ratio (leverage) and toincentive pay, deferred compensation and options granted. Meanwhile these factors' impact on Life insurers' total risk is not as significant. Systematic risk is negatively related to return on equity (profitability) and positively related to the liability-to-asset ratio (leverage), size, incentive pay, and option granted. Similar to their effects on total risk for Life insurers, these factors' impact on Life insurers' systematic risk is less significant. The authors concede that the low level of statistical significance may be due to the smaller sample size for Life insurers. The Sharpe ratio is positively related to return on equity and incentive pay. The Treynor ratio is negatively related to size for the all-insurer sample and the Life insurer sample; in addition, it is positively related to return on equity, and the liability-to-asset ratio for the Life insurer sample. Moreover, insurers traded on NYSE exhibit lower total risk and high systematic risk. Life insurers exhibit higher systematic risk.

Our findings provide useful insights regarding the risk and risk-adjusted return determinants that are under management's control and should be of interest to management, investors and regulators. With the understanding of how financial factors are related to risk (both systematic risk and total risk) and risk-adjusted return, managers are able to use market-based information to make operating, underwriting and investment decisions. Investors and regulators should be able to look into the risk and risk-adjusted reward issues in more depth and hopefully make better investment decisions and provide better regulatory surveillance.

REFERENCES

Alexander, G. J. and J. C. Francis (1986) *Portfolio Analysis*, 3rd ed, Englewood Cliffs

Baranoff, E. G., T. W. Sager, and T. S. Shively (2000) "A Semiparametric Stochastic Spline Model as a Managerial Tool for Potential Insolvency", *Journal of Risk and Insurance*, vol. 67(3), p. 369-396

Bodie, Z., A. Kane, and A. Marcus (2005) *Investment,* 10th ed, Boston et al.

Borde, S. F., K. Chambliss, and J. Madura (1994) "Explaining Variation in Risk Across Insurance Companies", *Journal of Financial Services Research*, vol. 8, p. 177-191

Brockett, L. P., L. L. Golden, J. Jang, and C. Yang (2006) "A Comparison of Neural Networks, Statistical Methods, and Variable Choice for Life Insurers' Financial Distress Prediction", *Journal of Risk and Insurance*, vol. 73(3), p. 397-419

Carson, J. M. and R. E. Hoyt (2000) "Evaluating the Risk of Life Insurer Insolvency: Implications from the US for the European Union"*, Journal of Multinational Financial Management*, vol. 10(3-4), p. 297-314

Carson, J. M. and R. E. Hoyt, (1995) "Life Insurer Financial Distress: Classification Models and Empirical Evidence", *Journal of Risk and Insurance*, vol. 62(4), p. 764-775

Chen, C. R., T. L. Steiner, and A. Whyte (2006) "Does Stock Option-Based Executive Compensation Induce Risk-Taking? An Analysis of the Banking Industry", *Journal of Banking and Finance*, vol. 30(2), p. 915-945

Chen, R. and K. Wong (2004) "The Determinants of Financial Health of Asian Insurance Companies", *Journal of Risk and Insurance*, vol. 71(3), p. 469-499

Cummins, D. J. and S. E. Harrington (1988) "The Relationship Between Risk and Return: Evidence for Property-Liability Insurance Stocks", *Journal of Risk and Insurance*, vol. 55(1), p. 15-31

Dodd, R. (2012) *Markets: Exchange or Over-the-Counter,* accessed online October 8, 2018 at International Monetary Fund Website: www.imf.org/external/pubs/ft/fandd/basics/markets.htm

Dong, Z., C. Wang, and F. Xie (2010) "Do Executive Stock Options Induce Excessive Risk Taking?", *Journal of Banking of Banking & Finance*, vol. 34, p. 2518-2529

Eling, M. and S. Marek (2012) "Internal and External Drivers for Risk Taking in UK and German Insurance Market", *International Journal of Banking, Accounting and Finance*, vol. 4(1), p. 48-76

Grace, E. (2004) "Contracting Incentives and Compensation for Property-Liability Insurer Executives", *Journal of Risk and Insurance*, vol. 71(4), p. 285-307

Gu, Z. and H. Kim (2002) "Determinants of Restaurant Systematic Risk: a Reexamination", *the Journal of Hospitality Financial Management,* vol. 10(1), p. 1-13

Harrington, S. E. (1983) "The Relationship Between Risk and Return: Evidence for Life Insurance Stocks", *Journal of Risk and Insurance*, vol. 50(4), p. 587-610

Huffman, S. P. (1989) "The Impact of the Degrees of Operating and Financial Leverage on the Systematic Risk of Common Stocks: Another Look", *Quarterly Journal of Business and Economics*, vol. 28(1), p. 83-100

Iqbal, M. J. and S. Z. A. Shah (2012) "Determinants of Systematic Risk", *The Journal of Commerce,* vol. 4(1), p. 47-56

Lee, J., and S. Jang (2007) "The Systematic-Risk Determinants of the US Airline Industry", *Tourism Management*, vol. 28, p. 434-442

Low, A. (2009) "Managerial Risk-taking Behavior and Equity-Based Compensation", *Journal of Financial Economics,* vol. 92(3), p. 470-490

Miles, J. A. (1986) "Growth Options and the Real Determinants of Systematic Risk", *Journal of Business Finance and Accounting*, vol. 13(1), p. 95-105

Moyer, C. R. and R. Chatfield (1983) "Market Power and Systematic Risk", *Journal of Economics and Business*, vol. 35(1), p. 123-130

Pottier, S. W. and D. W. Sommer (1999) "Property-Liability Insurer Financial Strength Ratings: Differences Across Rating Agencies", *Journal of Risk and Insurance,* vol. 66(4), p. 621-642

Reilly, F. K. and E. A. Norton (2003) *Investments,* 6th ed, Mason

Sharpe, W. F. (1966) "Mutual Fund Performance", *Journal of Business*, vol. 39(1), p. 119-128

Sharpe, W. F. (1994) "The Sharpe Ratio", *Journal of Portfolio Management*, vol. 21(Fall), p. 49-58.

Sharpe, W. F., G. J. Alexander, and J. V. Bailey (1999) *Investments*, 6th ed, Upper Saddle River

Sharpe, G. I. and A. Stadnik (2007) "Financial Distress in Australian General Insurers", *Journal of Risk and Insurance*, vol. 74(2), p. 377-399

Shim, J. (2010) "Capital-Based Regulation, Portfolio Risk and Capital Determination: Empirical Evidence from the US Property-Liability Insurers", *Journal of Banking & Finance*, vol. 34, p. 2450-2461.

Titman, S. and R. Wessels (1988) "The Determinants of Capital Structure Choice", *The Journal of Finance*, vol. 43(1), p. 1-19

Treynor, J. L. (1965) "How to Rate Management of Investments Funds", *Harvard Business Review*, vol. 43, p. 63-75

Voulgaris, F. and A. Rizonaki (2011) "On the Relationship Between Systematic Risk and Financial and Operating Risk: the Case of the Greek Listed Firms", *Global Business and Economics Review*, vol. 13, p. 204-221

Zhang, L. and N. Nielson (2015) "Solvency Analysis and Predication in Property-Casualty Insurance: Incorporating Economic and Market Predictors", *Journal of Risk and Insurance*, vol. 82(1), p. 97-124

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DYNAMICS BETWEEN EXCHANGE RATES AND STOCK PRICES: EVIDENCE FROM DEVELOPED AND EMERGING MARKETS

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ABSTRACT

This study examines the long- and short-run dynamics between exchange rates and stock prices by using cointegration methodology and multivariate Granger causality tests. We apply the analysis to six countries, including: Japan, United Kingdom, Hong Kong, China, India and Brazil over the period December 2007 to May 2013. The evidence suggests that the global financial crisis 2007-2009 is an important determinant of the link between the domestic stock and foreign exchange markets. The exchange rate is negatively related to the domestic stock market for emerging countries but positively for developed countries for entire sample and during the crisis. However, this relationship became positive for all countries after the crisis, except United Kingdom. The finding also indicates that the exchange rate movements contain some significant information to forecast the stock returns of these markets.

JEL: C3, F4,G1

KEYWORDS: Stock Price, Exchange Rate, Global Financial Crisis, Multivariate Granger Causality Tests

INTRODUCTION

A strong linkage between exchange rates and stock prices has become the focus of sustained research in the financial press. In retrospect of the literature, a number of hypotheses also suggest a causal relation between stock prices and exchange rates. For instance, flow oriented model of exchange rates (Ajayi & Mougoue, 1996) confirm that currency fluctuation effects international competitiveness and the balance of trade position, which in turn effects current and future cash flows of corporation and its stock price. Besides, stock price movement also can influence exchange rate fluctuation. In the portfolio-balance approach, exchange rates just like all other commodities which are determined by market mechanism. A blooming stock market would attract cash flows from foreign investors and hence causes an increase in the demand of a country's currency and vice versa (Pan, et al., 2007). As a result, the rising (declining) stock price is related to an appreciation (depreciation) in exchange rate.

In this paper, we examine dynamic linkages between foreign exchange and stock markets in the major financial markets, including: Japan, United Kingdom, Hong Kong, China, India and Brazil. These countries are significantly different in terms of the size of each economy, degree of development, rate of growth, and maturity of financial markets. Regarding the maturity of financial markets, Japan, United Kingdom and Hong Kong are considered developed markets, whereas China, India and Brazil are considered to be emerging markets.

The recent global financial crisis had debilitating effects on the stock markets of the concerned countries and highlights the importance of the international spillover of financial shocks. Poshakwale (2004) estimate the spillover effects of the financial shocks on 17 EU countries and 9 emerging economies in Europe using a global vector autoregressive model. They find that stock market is a main channel of spreading financial shocks across countries in the short term. This is caused by a strong coupling of countries, stock markets.

Pan et al. (2007) also find that "when stock price plummeted, exchange rate soared in case of Korea, and the volatilities of these variables also increased sharply due to a sudden stop of capital" during the 2007-2009 global financial crisis.

Taking the above situations into account, this paper empirically examines the interaction between exchange rates and stock prices for the periods during and after the 2007-2009 global financial crisis, to explore the long-run and short-run causalities between these variables. The paper tries to answer the following questions. Whether the linkages between analyzed economic variables are of the similar intensity and direction in the developed and emerging markets? How has been the relationship changing over the analyzed period? By including more countries and updating the data, the paper intends to find disparities among those similar countries who suffered from the common shocks of the global financial crisis and to draw more useful policy implications.

The rest of the paper is organized as follows. Section 2 is a literature review. Section 3 explains data and methodological issues. Section 4 presents the empirical results. The final section summarizes the main findings and conclusion.

LITERATURE REVIEW

There has been a strand of literature written on the dynamics relationship between exchange rate and stock price. Frank and Young (1972) were one of the early pioneers to investigate the relationship between exchange rates and stock prices. Their study concluded that the two variables have no significant relation. Ajayi et al. (1998), Stavarek (2004), and Rahman and Uddin (2009) all support the empirical findings of Frank and Young (1972). Specifically, Ajayi et al. (1998) examined the causal relations between changes in exchange rate and stock return by using the data eight Asian emerging markets from December 1987 to September 1991. They find no consistent causal relations could be established for the emerging economies. Stavarek (2004) apply a Vector Error Correction model to investigate the relationship between exchange rate and stock returns for eight European countries and the United States between the years 1969-1992, he documents evidence that no evidence for the relationship between these variables for most of the years and countries involved. Similarly, Rahman and Uddin (2009) investigate the dynamic relationship between stock prices and exchange rates and find no causal relationship for Pakistan, India and Bangladesh.

Contrary to the above studies, Aggarwal (1981) examines the relation of the US Dollar and US Stock prices, and concludes that due to efficiency of stock market the stock adjust quickly to changes in the exchange rate. Using the standard regression analysis, Solnik (1987) also finds that changes in the exchange rate has effect on the stock price return. Additionally, Ma and Kao (1990) examine the correlation between stock prices as a function of exchange rate and report a negative correlation between stock price return and exchange rate. Other study by Qiao (1996) on three leading financial centers in Asia, finds a bi-directional causal relationship in Tokyo, unidirectional causality from exchange rate to Hong Kong stock price and no causal relationship in Singapore. Wu (2000) applies cointegration and error correction analyses, finds that appreciation in exchange rates has long term positive effects in the stock prices in Singapore. Alternatively, Desislava (2005) uses a two-stage least squares model and shows an increase in the exchange rate depresses the stock market for the United State and the United Kingdom. Last but not least, Phylaktis and Ravazzolo (2005) show that the lack of causal relationship between the stock market and exchange rate in a country might be due to the omission of an important variable from the system, which may invalidate the results of some of the previous studies.

The critical variable omitted from the system in previous studies is the US stock market, which can be represented the influence of world stock market. If it is the case, the inference about the long run relationship of variables and the causality structure are invalid in an incomplete system (Caporale & Pittis, 1997). An increase in the US stock index conveys information about an improved situation of the US economy and

implies an increase in the US import and other countries' export since there are very strong trade links between the US and other economies. That leads to an appreciation of countries' currencies and a rise in their exchange rate, and on the other side, an increase in the domestic economic activities cause the local stock market to rise. Based on this argument, Kumar (2010) applies Granger causality models to examine the relationship in case of India and shows the evidence of bi-directional causality between exchange rate and stock price.

DATA AND METHODOLOGY

This study examines the interaction between stock prices and exchange rates for the periods before, during and after the 2007-2009 financial crisis. The data used are daily stock market indexes and exchange rate for 6 major financial markets including: 3 developed countries, namely Japan, United Kingdom and Hong Kong, and 3 emerging countries, namely China, India, andBrazil. The sample period runs from December 2007 to May 2013. All the stock index and exchange rate observations were obtained from the Yahoo finance and FX trade, respectively. The sample period is divided into two sub-periods – with period 1, from December 2007 to June 2009 representing the crisis period, and period 2, from July 2009 to May 2013 representing the after crisis period.

Cointegration

The relationship between domestic stock price and the exchange rate can be represented by:

$$SP_t = \alpha_0 + \alpha_1 EX_t + \alpha_2 US_t + v_t \quad (1)$$

Where SP_t is the log of domestic stock index, US is the log of US stock index, both expressed in real terms, EX_t is the log of nominal exchange rate defined as domestic prices per US dollar and v_t is the random error. The US stock market, which has been taken to represent the world capital markets, has been included as a possible conduit through which the foreign exchange and the local stock markets are linked. In an explicit two country framework, we will expect the increase in the US stock prices to cause a similar chain of events and the dollar to appreciate i.e. a rise in the exchange rate. Thus, the overall effect on the exchange rate will depend on the relative strength of the various competing events and α_1 will be either positive or negative accordingly.

In implementing the tests for cointegration we use the likelihood ratio test due to Johansen (1988). Let $Y_t \equiv$ (SP, EX, US) where SP and US are the stock price indices in real terms in countries and the US, respectively, and EX the exchange rate for each countries versus the US. We have 3 variables in the system in which SP and EX as known as endogenous variables while as US is exogenous variables. If Y_t is cointegrated, it can be generated by a Vector Error Correction Model:

$$\Delta Y_t = \mu + \sum_{i=1}^{k-t} G_i \Delta Y_{t-i} + G_k Y_{t-1} + e_t \quad (2)$$

where μ is a 2 × 1 vector of drift, G's are 2 × 3 matrices of parameters, and ε_t is a 2 × 1 white noise vector. The Johansen test is performed by calculating trace test statisticsof the null hypothesis that there are at most r cointegrating vectors $0 \leq r \leq 2$.

Multivariate Granger Causality Tests

Apart from the examination of the long-run co-movements of exchange rate and stock market index, we explore the long-run and short-run dynamics by performing Granger causality tests for cointegrating

systems. We apply the methodology for multivariate Granger causality tests for cointegrating systems suggested by Dolado and Lutkepohl (1996). In which, weestimate Vector Error Correction Model (VEC) if there is a cointegrating relationship between exchange rate and stock price. Otherwise, we apply a first order differenced Vector Autoregressive Model (VAR) if variables are known to be I(1) with no cointegration.

The method of Dolado and Lutkepoh is performed directly on the least squares estimators to estimate the coefficient of the long run cointergrating vector in levels of the variables. The procedure is based on the argument that the non-standard asymptotic properties of the Wald test on the coefficients of cointegrated VAR systems are due to the singularity of the asymptotic distribution of the least square estimators. Once cointegration is established, the long-run cointergrating vector model for each country can be estimated as equation 1.

In the final step, we obtain the short-run dynamic parameters by estimating a vector error correction model associated with the long-run estimates as in equation 3 and 4. In the spirit of Engle & Granger (1987) and Okere & Iheanacho (2016), "the long run relationship between the variables indicates that there is Granger-causality in at least one direction which is determined by the F-statistic and the lagged error-correction term. The short-run causal effect and is represented by the F-statistic on the explanatory variables while the t-statistic on the coefficient of the lagged error correction term represents the long-run causal relationship". We estimate the error correction term using the residual from a cointegrating regression of SP_t and EX_t . The following regressions are used:

$$\Delta \mathrm{EX_t} = \alpha_0 + \sum_{i=1}^{n} \lambda_i \Delta SP_{t-i} + \sum_{i=1}^{n} \rho_i \Delta EX_{t-i} + \sum_{i=1}^{n} \varphi_i \Delta \mathrm{US}_{t-i} + \pi \mathrm{ECT_{t-1}} + e_{et} \quad (3)$$

$$\Delta \mathrm{SP_t} = \rho_0 + \sum_{i=1}^{n} \delta_i \Delta SP_{t-i} + \sum_{i=1}^{n} \theta_i \Delta EX_{t-i} + \sum_{i=1}^{n} \upsilon_i \Delta \mathrm{US}_{t-i} + \partial \mathrm{ECT_{t-1}} + e_{st} \quad (4)$$

Where ΔEX_t and ΔSP_t denote the first difference data, with ΔEX_t [= EX_t– EX_{t-1}] equal to log (EX_t/EX_{t-1}), while ΔSP_t equal to log (SP_t/SP_{t-1}), ΔUS_t equal to log (US_t/US_{t-1}). ECT_{t-1} is a lagged error correction term derived from the long-run cointegrating relationship. Here λ_i, δ_i ,ρ_i, and θ_i are the short run dynamic coefficients of the model's convergence to equilibrium and $\pi$and∂ are the speed of adjustment. The sign before π and ∂ or the sign of error correction term should be negative after estimation. The coefficient π and ∂ tell us at what rate it corrects the previous period disequilibrium of the system.

The null hypothesis that stock price does not Granger-cause exchange rate is rejected if the λ_i coefficients in Eq. (3) are jointly significantly different from zero using the joint test (e.g., an χ^2 test). Similarly, exchange rate is said to Granger-cause stock price if the δ_i coefficients in Eq. (4) are jointly different from zero. A bi-directional causality (or feedback) relation exists if both the ρ_i and θ_i coefficients are jointly different from zero. However, if the variables are not cointegrated we use VAR model in the first difference in the estimation given that both variable are I(1).

RESULTS

Unit Roots Test

The first procedure for any analysis involving time series data is to determine the stationary of each variable by checking for the unit roots. Before done this test, we transform all the time series data into natural logarithms values and plot variables together to examine time-series variables. The results show that these

variables are trending and characteristics of non-stationary variables. To recheck this result, the Augmented Dickey-Fuller (ADF) test has been used to conduct the unit root test for the exchange rate and stock market index series of the six countries. According to our results, all variables are non-stationary at the level series but not in the first-difference series. Therefore, all the data can be described as an I(1) process, and hence the Granger causality test should be conducted on the first-difference data.

Cointegration Results

After testing for stationarity, we use the log of US stock market index as an exogenous variable, and apply Johansen cointegration test to find out the long-run cointegrating relationship between stock price and exchange rate. The lag structure is chosen by using Akaike Information Criterion (AIC) value for the unrestricted VAR model. Table 1 contains the Johansen cointegration test results by using smallest AIC values. The trade test for the presence of a long-run relationship between exchange rates and stock prices cannot be rejected at least at the 5 % level of significance for almost cases. Except for the case of China and Japan in the full period and post-crisis period, there is no evidence of a long-run relationship between exchange rates and stock prices.

Table 1: Multivariate Cointegration Test Between Exchange Rates and Stock Market Indexes

Country	*Johansen test statistics*				*LAG*	*AIC*
	Ho: r = 0		*Ho: r <=1*		*(3)*	*(4)*
	Trace Value	*P-value*	*Trace Value*	*P-value*		
Japan						
Dec 2007 –May 2013	11.609	0.177	0.231	0.267	3	- 21.486
Dec 2007 - June 2009	18.002**	0.021	4.042**	0.044	2	-12.457
July 2009 - May 2013	3.207	0.157	0.013	0.999	4	-12.596
United Kingdom						
Dec 2007 - May 2013	426.034***	0.000	2.326	0.127	5	-13.469
Dec 2007 - June 2009	252.432***	0.000	9.258***	0.002	4	-12.288
July 2009 - May 2013	237.032***	0.000	5.301**	0.021	3	-14.529
Hong Kong						
Dec 2007 - May 2013	49.893***	0.000	14.903***	0.000	5	-18.029
Dec 2007 - June 2009	48.757***	0.000	4.689**	0.030	5	-17.508
July 2009 - May 2013	22.862***	0.003	9.119***	0.002	3	-18.748
China						
Dec 2007 - May 2013	8.234	0.447	2.113	0.146	6	-15.565
Dec 2007 - June 2009	8.554	0.408	3.141*	0.076	1	-15.418
July 2009 - May 2013	9.133	0.353	0.076	0.782	6	-15.916
India						
Dec 2007 - May 2013	582.296***	0.000	0.023	0.880	6	-13.145
Dec 2007 - June 2009	444.262***	0.000	3.808*	0.051	3	-13.047
July 2009 - May 2013	309.499***	0.000	0.133	0.715	6	-13.838
Brazil						
Dec 2007 - May 2013	21.779***	0.005	4.262**	0.039	4	-11.053
Dec 2007 - June 2009	26.449***	0.001	10.626***	0.001	4	-9.854
July 2009 - May 2013	23.491***	0.003	0.591	0.442	3	-12.333

This table reports the results of the multivariate cointegration test between exchange rates and stock market indexes by using the likelihood ratio test of Johansen (1988). SP are the log of domestic stock index, US is the log of US stock index, both expressed in real terms. EX is the log of nominal exchange rate defined as domestic prices per US dollar. We have 3 variables in equation 1, where SP and EX as known as endogenous variables while as US is exogenous variables. $SP_t = \alpha_0 + \alpha_1 EX_t + \alpha_2 US_t + v_t$ *(1). The lag structure is chosen by using smallest Akaike Information Criterion (AIC) value for the unrestricted VAR model. *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.*

When two variables are cointegrated then Granger causality exists in at least one direction. Table 2 shows the long-run relationship between exchange rate and stock market index through the sample period. The results show that the exchange rate is negatively related to the domestic stock market for emerging countries but positively for developed countries, except United Kingdom. However, we find that these relationships

become positive and significant for India (α_1= 0.386) and Brazil (α_1= 0.124) after the crisis period. The results are also provided that the US stock market index (α_2) is positively and significant related to the domestic stock markets in all cases which support evidence for the integration of these stock markets with US stock market.

Table 2: Long Run Cointegrating Vector Estimates

Country	Time Period	α_0	α_1	α_2
Japan	Dec 2007 - June 2009	7.629***	0.394**	0.379***
United Kingdom	Dec 2007 - May 2013	0.916***	-0.424***	0.884***
	Dec 2007 - June 2009	0.424***	-0.500***	0.943***
	July 2009 - May 2013	1.679***	-0.379***	0.797***
HongKong	Dec 2007 - May 2013	3.914*	0.948	0.892***
	Dec 2007 - June 2009	21.590***	10.495***	1.103***
	July 2009 - May 2013	14.452***	4.147***	0.449***
India	Dec 2007 - May 2013	-8.262***	-0.437***	1.019***
	Dec 2007 - June 2009	-4.965***	-0.005	0.837***
	July 2009 - May 2013	-8.363***	0.386***	1.053***
Brazil	Dec 2007 - May 2013	9.874***	-1.126***	0.199***
	Dec 2007 - June 2009	7.736***	-0.743	0.405***
	July 2009 - May 2013	6.386***	0.124***	0.516***

This table reports the results of long-run relationship between exchange rate and stock market index in the case that two variables are cointegrated. The least squares regressions of domestic stock price on exchange rate and US stock index is used: $SP_t = \alpha_0 + \alpha_1 EX_t + \alpha_2 US_t + v_t$ *(1) where SP is the log of domestic stock index, EX is the log of nominal exchange rate and US is the log of US stock index. *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.*

We then perform the test of excluding each of the variables from the cointegrating relationship. The Wald Test is used to test the null hypothesis that the individual elements of α is equal to zero. Table 3 shows that the restriction cannot be rejected for EX_t in case of Hong Kong for full period (Chi-square = 0.842), India and Brazil for the crisis period. It implies that the exchange rate is not participating in the cointegrating vector in these cases. For other cases, the restriction is rejected, which implies that these estimated coefficients of the accepted cointegrating vectors are statistically significant.

Table 3: Test of Exclusion Restrictions for EX and US from the Long Run Cointegrating Vector

Country	Time Period	*Ho: $\alpha_0 = 0$*	*Ho: $\alpha_1 = 0$*	*Ho: $\alpha_2 = 0$*
Japan	Dec 2007 - June 2009	222.299***	5.560**	80.148***
United Kingdom	Dec 2007 - May 2013	589.187***	2,639.898***	39,095.140***
	Dec 2007 - June 2009	7.9187***	195.865***	2,433.595***
	July 2009 - May 2013	44.101***	362.826***	16,307.560***
Hong Kong	Dec 2007 - May 2013	3.602*	0.842	3,566.362***
	Dec 2007 - June 2009	16.721***	5.118***	1,182.949***
	July 2009 - May 2013	39.414***	3.873***	405.912***
India	Dec 2007 - May 2013	32,848.31***	4,705.254***	77,543.38***
	Dec 2007 - June 2009	872.093***	0.049	8,211.768***
	July 2009 - May 2013	17,645.830***	1,869.751***	20,154.770***
Brazil	Dec 2007 - May 2013	809.971***	425.927***	30.783***
	Dec 2007 - June 2009	271.876***	2.557	73.112***
	July 2009 - May 2013	184.218***	85.003***	109.301***

*This table shows the test of exclusion restrictions for EX and US from the Long Run Cointegrating Vector in Table 2. Chi-square statistic to test the null hypothesis that the individual elements of α is equal to zero. *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.*

In particular, on the case of Japan, Table 2 shows the long-run cointergrating parameter α_1 to be 0.394 and the test of excluding EX and US from the equation in Table 3 are rejected and the both statistically

significant with χ^2 (1) equal 5.560 and 80.148, respectively. That means 1% increase in Japanese Yen per US dollar leads to approximately 0.394 % increase in Tokyo stock exchange index for crisis period. Similarly, the coefficient of log US is 0.379 that means 1% increase in New York stock exchange leads to approximately 0.379 % increase in Tokyo stock exchange index in the same period.

Furthermore, the exchange rate is positive and significant relationship to Hong Kong stock exchange index for both crisis and post crisis period. However, this relationship is insignificant for full period, which shows the appearance the impact of the financial crisis in these results. In order to examine whether the global financial crisis from 2007 to 2009 has had impact on the long run relationship between exchange rate and stock market index, we rewrite equation 1 as the following:

$$SP_t = \alpha_0 + \alpha_1 EX_t + \alpha_2 US_t + \alpha_3 Crisis + \alpha_4 Crisis\ EX_t + \alpha_5 Crisis\ US_t + v_t \quad (5)$$

where all variables are as previously defined. Crisis here is a dummy variable, which equals to 1 for the crisis period from December 2007 to June 2009; 0 for post-crisis period from July 2009 to May 2013.

Table 4 reports the estimated coefficients of the crisis variable (α_3) which show that crisis has a positive and very significant impact on Hong Kong, India and Brazil stock market index. On the contrary, the crisis has a negative but also significant impact to London stock index. Importantly, the coefficient of *US* and the interaction terms *Crisis*US* in the case of United Kingdom is statistically significant at 1% level with a coefficient of 0.797 and 0.147, respectively. Economically, 1% increase in New York stock exchange leads to approximately 0.944% (0.797 + 0.147) increase in London stock index during crisis period but only 0.797 % increase in London stock index in post crisis period. This evidence indicates that the effect of US stock market on domestic stock market is more pronounced during crisis period.

Table 4: Effect of Global Financial Crisis on the Long Run Cointegrating Vector Estimates

Country	α_0	α_1	α_2	α_3	α_4	α_5
United Kingdom	1.679***	-0.379***	0.797***	-1.255***	-0.121	0.147***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Hong Kong	14.452***	4.147***	0.449***	7.138**	6.347**	0.655***
	(0.000)	(0.000)	(0.000)	(0.026)	(0.027)	(0.000)
India	-8.363***	-0.386***	1.053***	3.397***	-0.391***	-0.216***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Brazil	6.386***	-0.124	0.516***	1.350**	-0.867***	-0.111
	(0.000)	(0.126)	(0.000)	(0.040)	(0.000)	(0.102)

This table shows regression results based on equation (5). We estimates the effect of global financial crisis 2007-2009 on the long run relationship between exchange rate and stock market index by adding crisis variable and the interaction terms into Equation 1. $SP_t = \alpha_0 + \alpha_1 EX_t + \alpha_2 US_t + \alpha_3 Crisis + \alpha_4 Crisis\ EX_t + \alpha_5 Crisis\ US_t + v_t$ *(5) where Crisis is a dummy variable, which equals 1 if the time is from 01 December 2007 to 30 June 2009; 0 if otherwise. The P-values are displayed in parentheses. *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.*

Multivariate Granger Causality Tests

We examine the dynamics relationship between exchange rate and stock price by performing multivariate Granger causality tests. Table 5 shows the results of the short-run dynamic coefficients associated with the long-run relationships obtained from the equation 3 and 4. When the dependent variable is ΔSP, the results show that most of the exchange rate movements are significant predictors of domestic stock returns. Except for the case of Japan for crisis period and India, the results indicate that no short run relationships exist between exchange rate changes and stock returns. On the other hand, the domestic stock returns are highly responsive to US stock return at various lag in United Kingdom, Hong Kong and Brazil.

Beginning with the results for the long-run in other cases, the coefficient on the lagged error-correction term are significant at 5% or 1% level with the expected sign, which confirm the result of the Johansen test for cointegration. For instance, on the case of United Kingdom for post-crisis period, its value is estimated to -0.061 and significant at 1% level which implies that the speed of adjustment to equilibrium after a shock. Approximately 6.1 % of disequilibrium from the previous day's shock converges back to the long-run equilibrium in the current day.

Besides, when the dependent variable is ΔEX, The results show that stock returns are significant to predict exchange rate movements in Japan, United Kingdom, Hong Kong, India and Brazil for full period. In the case of United Kingdom and Brazil for full sample period, the ρ_i and θ_i coefficients are jointly different from zero. Thus, there is evidence that a bi-directional causality (or feedback) relation exists for stock returns and exchange rate movements for these countries. The results also show the channel through which US stock return and domestic exchange rate are linked, except for Hong Kong in crisis period.

Table 5: Multivariate Granger Causality Tests Between Exchange Rate Movements and Stock Returns Using VECM (to Be continued)

Country	$\Delta \mathrm{SP_t} = \rho_0 + \sum_{i=1}^{n} \delta_i \, \Delta SP_{t-i} + \sum_{i=1}^{n} \theta_i \, \Delta EX_{t-i} + \sum_{i=1}^{n} \nu_i \, \Delta \mathrm{US}_{t-i} + \partial \, \mathrm{ECT}_{t-1} + e_{st}$ (3)			
	∂ Coefficient [t-statistics]	**Chi-sq (P value) Ho: θi=0**	**Ho: υi=0**	**Granger Causality**
Japan				
03 Dec 2007 - 15 May 2013	-0.022*** [-3.589]	1.575 (0.455)	0.914 0.633	NO
United Kingdom				
03 Dec 2007 - 15 May 2013	-0.037* [-1.765]	19.067 (0.002)	158.365 (0.000)	YES
03 Dec 2007 - 30 June 2009	-0.029 [-0.656]	4.718 (0.318)	50.011 (0.000)	US YES
01 July 2009 - 15 May 2013	-0.061*** [-3.297]	14.322 (0.003)	56.207 (0.000)	YES
Hong Kong				
03 Dec 2007 - 15 May 2013	0.002 [0.735]	4.602 (0.466)	303.801 (0.000)	US YES
03 Dec 2007 - 30 June 2009	0.000 [-0.148]	4.984 (0.418)	0.007 (0.000)	US YES
01 July 2009 - 15 May 2013	0.000 [0.122]	4.191 (0.242)	392.414 (0.000)	US YES
India				
03 Dec 2007 - 15 May 2013	-0.031 [-1.341]	1.903 (0.928)	7.478 (0.279)	NO
03 Dec 2007 - 30 June 2009	-0.146 [-1.589]	0.997 (0.802)	3.533 (0.317)	NO
01 July 2009 - 15 May 2013	-0.005** [-2.098]	1.523 (0.958)	4.515 (0.607)	NO
Brazil				
03 Dec 2007 - 15 May 2013	-0.004*** [3.617]	15.258 (0.004)	5.130 (0.274)	EX YES
03 Dec 2007 - 30 June 2009	-0.012 [0.893]	13.388 (0.010)	0.880 (0.927)	EX YES
01 July 2009 - 15 May 2013	-0.016*** [-3.196]	1.059 (0.787)	15.354 (0.002)	US YES

*This table shows the results of the short-run dynamic coefficients associated with the long-run relationships between exchange rates and stock returns obtained from the equation 3 and equation 4. YES indicates significant causal relationship between exchange rate movement, domestic stock return and US stock return. NO indicates no significant causal relationship was found. US YES indicates significant causal relationship between US stock returns and dependent variable. The P-values are displayed in parentheses. T-statistics are in [ ], the critical t-statistics values are 1.645(10%), 1.960 (5%) and 2.576 (1%). *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.*

Table 5: Multivariate Granger Causality Tests Between Exchange Rate Movements and Stock Returns Using VECM (Continued)

Country	$\Delta EX_t = \alpha_0 + \sum_{i=1}^{n} \lambda_i \Delta SP_{t-i} + \sum_{i=1}^{n} \rho_i \Delta EX_{t-i} + \sum_{i=1}^{n} \varphi_i \Delta US_{t-i} + \pi ECT_{t-1} + e_{et}$ (4)			
	π Coefficient	**Chi-sq (P value)**		**Granger Causality**
	[t-statistics]	**Ho: λ_i=0**	**Ho: φ_i=0**	
Japan				
03 Dec 2007 - 15 May 2013	-0.007	6.085	49.148	YES
	[1.483]	(0.048)	0.000	
United Kingdom				
03 Dec 2007 - 15 May 2013	-0.003	25.016	89.664	YES
	[-0.395]	(0.000)	(0.000)	
03 Dec 2007 - 30 June 2009	-0.060***	10.046	24.222	YES
	[-3.723]	(0.040)	(0.000)	
01 July 2009 - 15 May 2013	0.002	19.494	94.864	YES
	[0.198]	(0.000)	(0.000)	
Hong Kong				
03 Dec 2007 - 15 May 2013	-0.0002***	2.338	22.438	US YES
	[-3.513]	(0.801)	(0.000)	
03 Dec 2007 - 30 June 2009	-0.00001**	4.743	5.625	NO
	[-2.223]	(0.448)	(0.344)	
01 July 2009 - 15 May 2013	-0.0001***	7.131	30.769	YES
	[-3.340]	(0.068)	(0.000)	
India				
03 Dec 2007 - 15 May 2013	-0.021**	18.696	54.536	YES
	[-2.344]	(0.005)	(0.000)	
03 Dec 2007 - 30 June 2009	0.010	10.800	24.419	YES
	[0.347]	(0.013)	(0.000)	
01 July 2009 - 15 May 2013	0.000	8.289	31.162	US YES
	[0.280]	(0.218)	(0.000)	
Brazil				
03 Dec 2007 - 15 May 2013	0.000	10.814	80.747	YES
	[0.507]	(0.029)	(0.000)	
03 Dec 2007 - 30 June 2009	-0.001	7.666	37.440	US YES
	[-0.763]	(0.105)	(0.000)	
01 July 2009 - 15 May 2013	-0.002	4.340	57.064	US YES
	[-0.759]	(0.227)	(0.000)	

*This table shows the results of the short-run dynamic coefficients associated with the long-run relationships between exchange rates and stock returns . YES indicates significant causal relationship between exchange rate movement, domestic stock return and US stock return. NO indicates no significant causal relationship was found. US YES indicates significant causal relationship between US stock returns and dependent variable. The P-values are displayed in parentheses. T-statistics are in [ ], the critical t-statistics values are 1.645(10%), 1.960 (5%) and 2.576 (1%). *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.*

Furthermore, the Johansen test results show no cointegrating relationship between exchange rate and stock market index in case of China and Japan for the full sample period and post crisis period. Thus we can't use VER model to examine the Granger causality between the variables. Instead, we use estimate the VAR model in the first difference level. The results are shown in Table 6 which suggests that there is no statistically casual relationship between exchange rate movements and stock market returns in these periods. However, there is unidirectional Granger causality between Shanghai Stock return and china exchange rate movement for the post crisis period. In addition, the results show that the Japanese Yen rate and Chinese Yuan Renminbi movements are highly responsive to US stock return, except for China in the post crisis period. It is interesting to note that US stock return also is significant Granger cause Shanghai stock return at 1% level, but no cause for Tokyo stock return.

Table 6: Multivariate Granger Causality Tests Between Exchange Rate Movements and Stock Returns using VAR

Country	Equation 6			Equation 7			
	Chi-sq (P value)		Granger Causality	Chi-sq (P value)		Granger Causality	Lag
	Ho: θ_i=0	Ho: υ_i=0		Ho: λ_i=0	Ho: φ_i=0		
Japan							
Dec 2007 - May 2013	0.050	0.067	NO	2.653	25.220***	US YES	1
	(0.823)	(0.795)		(0.103)	(0.000)		
July 2009 - May 2013	0.253	0.044	NO	0.741	5.648***	US YES	1
	(0.615)	(0.834)		(0.389)	(0.018)		
China							
Dec 2007 - May 2013	5.126	26.948***	US YES	4.010	18.033***	US YES	6
	(0.528)	(0.000)		(0.675)	(0.006)		
Dec 2007 - June 2009	0.515	11.481***	US YES	0.380	4.141**	US YES	1
	(0.473)	(0.001)		(0.538)	(0.042)		
July 2009 - May 2013	0.003	33.547***	US YES	6.294***	0.775	SP YES	6
	(0.957)	(0.000)		(0.012)	(0.379)		

This table shows the multivariate Granger Causality tests between exchange rate movements (ΔEX) and stock returns (ΔSP) using VAR in the case that Johansen test results show no cointegrating relationship as the equations:

$\Delta SP_t = \rho_0 + \sum_{i=1}^{n} \delta_i \Delta SP_{t-i} + \sum_{i=1}^{n} \theta_i \Delta EX_{t-i} + \sum_{i=1}^{n} \nu_i \Delta US_{t-i} + e_{st}$ *(6)*

$\Delta EX_t = \alpha_0 + \sum_{i=1}^{n} \lambda_i \Delta SP_{t-i} + \sum_{i=1}^{n} \rho_i \Delta EX_{t-i} + \sum_{i=1}^{n} \varphi_i \Delta US_{t-i} + e_{et}$ *(7)*

*NO indicates no significant causal relationship was found. US YES indicates significant causal relationship between US stock returns and dependent variable. SP YES indicates significant causal relationship between domestic stock return and exchange rate movement. The lag structure is chosen by using smallest Akaike Information Criterion (AIC). The P-values are displayed in parentheses. *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.*

CONCLUDING COMMENTS

This paper explores the long run and short run dynamics between exchange rate and stock market index in the main stock exchanges over the world for six countries, including Japan, United Kingdom, Hong Kong, China, India and Brazil. Our main concerns are to examine whether these links were affected by the existence of US stock exchange controls, and by the 2007-2009 global financial crisis. The following conclusions have been derived from our analysis. Firstly, our analysis provides evidence that the New York stock index is an important causing (exogenous) variable. The result is also found that the US stock market index is positively and significant related to the domestic stock prices. It acts as a conduit to link the world financial market and local stock markets and confirms the influence of the United State in these countries. This finding casts doubts on the inference of previous studies on the link between exchange rate and stock price, which did not include the influence of the US stock markets.

Secondly, Johansen cointegration test shows that there exists a long run relationship between exchange rate and stock market index. In which, the exchange rate is negatively related to the stock market for emerging countries but positively for developed countries, except United Kingdom. At the same time, the results are provided that the US stock market index is positively and significant related to these local stock markets. Besides, the global financial crisis 2007-2009 has been found to be an important determinant of the link between the domestic stock and foreign exchange markets. We also find that the crisis has a positive and very significant impact to Hong Kong, India and Brazil stock market index, but negative impact to London stock index.

Thirdly, the results of Multivariate causality tests indicate that on the whole, most of the exchange rate movements are significant predictors of domestic stock returns. Except for the case of Japan for crisis period, India and China the results indicate that no short run relationships exist between exchange rate

changes and stock returns. On other hand, the stock returns are also significant to predict exchange rate movements in Japan, Hong Kong and India. In the case of United Kingdom and Brazil for full sample period, there is evidence that a bi-directional causality (or feedback) relation exists for stock returns and exchange rate movements. Accordingly, financial managers can obtain more insights in the management of their portfolio affected by these variables (stock market index, exchange rate and US stock index). This should be particularly important to local as well as foreigner investors for diversifying and hedging their portfolio.

Finally, the paper data are drawn from only 6 major financial markets, thus the generalization of this sample for advanced markets and emerging markets is restricted. Besides, one limitation of database research is that the validity of the finding by explaining the results may not be fully reflected the nature of the economic relationship. For instance, unlike developing countries, most developed countries adopt a freely floating exchange rate system and have less capital controls. Therefore, it is reasonable to expect that exchange rates are more fully response to stock market movements in developed countries than developing ones. Similarly, capital controls may weaken the dynamic linkages between exchange rates and equity markets. Thus an interesting avenue of further research is to check in more detail about each country policies and their influence on the relationship between stock and foreign exchange markets.

REFERENCES

Aggarwal R. (1981) "Exchange Rates and Stock Prices: A Study of US Capital Markets Under Floating Exchange Rates,"*Akron Business and Economics Review*, vol. 12(2), p. 7-12.

Ajayi, R.A., Friedman, J. and Mehdian, S.M. (1998) "On the Relationship between Stock Returns and Exchange Rates: Tests of Granger Causality,"*Global Finance Journal*, vol. 9, p. 241-51.

Ajayi, R.A., Mougoue M. (1996). On the dynamic relation between stock prices and exchange rates.*Journal of Financial Research*, *19*, 193–207.

Caporale, G.M. and Pittis, N.(1997).Causality and forecasting in incomplete systems. *Journal of Forecasting*, *16* (6), 425–437.

Desislava, D. (2005). The relationship between exchange rates and stock prices: Studied in a multivariate model. *Political Economy*, *14*, 1-25.

Dolado, J.J. & Lütkepohl, H. (1996).Making Wald tests work for cointegrated VAR systems. *Econometric Reviews*, *15* (4).

Engle R.F. & Granger C.W.J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, *55* (2), 251-276.

Frank, P., &Young A. (1972). Stock Price Reaction of Multinational Firms to Exchange Realignments.*Financial Management*, *1*(3), 66-73.

Granger, C.W.J. (1988). Some recent developments in a concept of causality. *Journal of Econometrics*, *39*, 199-211.

Johansen, S. (1988). Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, *12*(2–3), 231-254.

Kumar, M. (2010). Causal relationship between stock price and exchange rate: evidence from India. *International Journal of Economic Policy in Emerging Economies*, *3*(1), 85-101.

Okere, K., Iheanacho, E. (2016). The Impact of Trade Protectionist Policy on the Economic Growth of Nigeria. *International Journal of Finance and Accounting*, 5(4), 171-183.

Pan, M., Robert C. & Liu, Y.A. (2007). Dynamic linkages between exchange rates and stock prices: Evidence from East Asian markets. *Review of Economics & Finance*, *16*(4), 503–520.

Phylaktis, K. &Ravazzolo, F. (2005).Stock prices and exchange rate dynamics. *Journal of International Money and Finance*, *24*(7), 1031–1053.

Poshakwale, S. S. (2004). Exchange Rate and Stock Price Interactions in European Emerging Financial Markets Before and After the Euro.*EFMA 2004 Basel Meetings Paper*

Qiao Y. (1996). Stock Prices and Exchange Rates: Experiences in Leading East Asian Financial Centres-Tokyo, Hong Kong and Singapore. *The Singapore Economic Review*, *41*(1), 47-56.

Rahman, L. & Uddin, J. (2009). Dynamic Relationship between Stock Prices and Exchange Rates: Evidence from Three South Asian Countries. *International Business Research*, *2* (2), 167-174.

Solnik B. (1987). Using Financial Prices to Test Exchange Rate Models: A Note.*Journal of Finance*, *41*(1), 141-149.

Stavarek, D. (2004). Stock Prices and Exchange Rates in the EU and the USA: Evidence of their Mutual Interactions. *Journal of Economics and Finance*, *55*(3-4), 141-161.

Wu, Y. (2000). Stock prices and exchange rates in a VEC model-the case of Singapore in the 1990s. *Journal of Economics and Finance*, *24*(3), 260-274.

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COMPARISON OF THE EUROPEAN AND THE U.S. UNREGULATED STOCK MARKETS DESIGNED FOR SMES

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ABSTRACT

This paper examines the state of small and medium enterprises (SMEs) in European and U.S. unregulated stock markets. The analysis compares the performance of both markets, using the weekly adjusted closing index prices of Euronext all share index, NYSE AMEX Composite Index, and the OTCM ADR Index for the 2013-2017 period. ADF, EGARCH, and ARCH tests were performed on the collected time series data, to measure and forecast index price volatility, risk and return. The results show a high level of price volatility in some periods; but a permanent effect of shocks was not observed in the long term for all the analyzed indexes. Negative shocks cause more volatility than positive shocks. However, an overall result shows that, the Euronext all share index, despite slight declines, displays an upward trend and relatively higher returns with less risk, than the NYSE AMEX Composite Index, and the OTCM ADR Index. This results reflects the better performance of the European unregulated market, compare to its U.S. counterparts.

JEL: M130, G1, C120, C220

KEYWORDS: Small and Medium Enterprises, Stock Markets, Initial Public Offering, Index Prices, Financial Risk and Return

INTRODUCTION

Although a significant amount of reports and studies have been conducted regarding SMEs in the American, the Asian, the European unregulated stock markets and elsewhere (Hall, 2007; OICV IOSCO 2015; Bremus, 2015; Kiškis, Limba and Gulevičiūtė, 2016; Kentaro, 2016 and others); studies comparing SMEs' unregulated stock markets performance to each other, locally or internationally are scarce. This study bridges the gap, by identifying the stock markets specially designed for SMEs, by highlighting the conditions under which they are listed in term of IPO (Initial Public Offering) requirements in the European and the U.S unregulated stock markets. Then, based on index prices, accesses their performances through the measurement of volatility, risk and return. EGARCH-M and ARCH LM models were also applied to evaluate the asymmetrical impacts of positive and negative shocks on volatility.

For our analysis, weekly adjusted closing stock prices of the major pan-European unregulated stock market (Euronext All Share index) and the weekly adjusted closing prices of the two main American unregulated markets (NYSE AMEX Composite index and the OTC ADR index) were examined. In addition to the main research questions we also asked, what are the respective definitions of SMEs in Europe and the U.S.? and What are the stock markets specially designed for SMEs in the two blocks?

Even if neither of the two markets should be regarded as superior to the other, this research gives insight to investors looking for investment opportunities, and SMEs mangers seeking financing sources. The remainder of the paper is organized as follows. The first section highlights the theoretical framework of the

study. The second section presents the data and methodology used in our analysis. The last two sections discuss the results and provide a conclusion.

LITERATURE REVIEW

In this section we present an overview of SMEs in the two sides of the Atlantic. We begin with SMEs financing difficulties, then discussed the pros and cons of an IPO, and finally investigate the impacts of SMEs on both economies. SMEs financing difficulties appear to be one of the most recurrent economic debates. That fact has been aggravated by the outbreak of the 2008 financial crisis that affected the world economy. This event made banks intensify regulations on credit granting and investors becoming tougher on their required guarantees and conditions to finance projects (Wehinger, 2013; Udell, 2015; Akala, 2017). Loan rejections increased 2.5 times since 2008, compared to 2004 from 6.1% to 16.3% (Sannajust, 2014). According to the International Finance Corporation (IFC), to satisfy SMEs formal demands around the world, credit had to increase between U.S $900 to $1,100 billion in 2011 (Alves de la Camapa, 2013). In brief, financial institutions revised their credit requirements upward. Thus, unlike large businesses, SMEs find themselves in an increasingly complex and arduous situation, regarding financing from external sources, due to the credit crunch caused by the economic downturns.

With regard the financing difficulties encountered by SMEs, one of the other alternatives available is stock market (Gupta & Saini, 2016). Besides being an alternative, most enterprises start as small private business and at some point, in their growth strategy. They decide to go public, to allow the enterprises shares to become more liquid (Chemmanur & Fulghieri, 1999). Going public confers to the shares, several advantages, compared to those of an unlisted company, Unlisted firms source of financing is more often guaranteed by auto-financing, bank credit lines, leasing, bank loans or one large investor (institutional investor, venture capitalist, crowdfunding, or angel) reported the European Central Bank (ECB) in 2017. Periodic dissemination of information related to the evolution and the prospects of a listed company, guarantees the interests of minority shareholders and facilitate the mergers and acquisition (M&A) process (Chod and Lyandres, 2008). It increases the company's visibility, improves information availability to external agents, and as a result, increases public awareness of the company and its products (Stoughton, Wong, et al., 2001).

An IPO makes it possible to call external investors to carry out projects that companies can't undertake on their own, due to the lack of financial means, or the will to finance alone because of risk factors. Therefore, an IPO allows spreading the risk, and significantly minimizing its effects. A listed company's evolution is followed and analyzed by financial analysts and investors. That market surveillance puts pressure on managers and encourages them to manage the company in the best way to avoid sanctions or decline in shares prices (Bharat and Dittmar 2010). An IPO is therefore a powerful tool for companies seeking funding for development. Notwithstanding these numerous IPO advantages, the European Commission (EC) survey on the access to finance of enterprises in 2014, and the European Saving and Retail Banking Group (ESRB) report in 2016, shows that banks remain the main source of financing for SMEs at 69% in the U.S. and 60% in the EU. This may be due to the fact that an IPO may cause a loss of managerial autonomy (Boot, Gopalan, et al.,2006) and reduction or loss of private benefits, related to capital ownership (Zingales, 1995). The public disclosure of financial information by a listed company, can damage its competitiveness in the market, in favor of its competitors (Farre-Mensa, 2010). Companies are advised not to disclose all strategic information to limit competition. However, the retention of valuable information can also be interpreted by the investor as a bad news signal (Pozniak and Guillemette, 2013). The listing of companies shares entails significant and different costs, such as admission fees, underwriting fees, annual fees, recurrent costs of production, and the cost of information disclosure to the market (financial reports in accordance with the regulatory standards, time spent by the manager to make those information available, financial communication… etc.) (Pagano, 1993).

However, the root factor of interest and devotion of economists toward SMEs, is essentially due to their large contribution to economic growth. In 2015, the European Bank for Reconstruction and Development (EBRD), reported that "SMEs make up over 99% of the total number of businesses…They are responsible for large contribution to value added and employment in the countries where they operate"; according to EC, "SMEs represent 99,8% off all enterprises in the non-financial business sector accounting for 67% of total in the European Union (EU)." In 2016, the U.S. Small Business Administration (SBA), indicated that SMEs represent 99,7% of all U.S. businesses, and offer 48% of employment. Similarly, from the database of companies subject to VAT (Delporte, 2017), in 2015 there were 869,662 businesses in Belgium, of which 863,165 (99.25%) SMEs, generated nearly 70% of jobs, and 62.3% of value added in the private sector.

THEORETICAL FRAMEWORK

To conduct our analysis, it is necessary to precisely define the meaning of SMEs and display their IPO conditions respectively, in the European and the U.S. stock markets. SMEs definitions: The factors determining whether an enterprise is an SME or not in Europe are based on: Staff headcount and Either turnover or balance sheet total as shown in Table 1.

Table 1: SME Defined as in EU Recommendation

Enterprises Category	Staff Headcount	Turnover	Balance Sheet Total
Medium-sized	< 250	≤ € 50 million	≤ € 43 million
Small	< 50	≤ € 10 million	≤ € 10 million
Micro	< 10	≤ € 2 million	≤ € 2 million

Table 1 presents enterprises categories with their classification criteria under the EU recommendations. This table shows that, a business with headcount of fewer than 250, a turnover fewer than € 50 million and a total balance sheet fewer than € 43 million is classified as a medium-sized enterprise. A business with a headcount of fewer than 50, a turnover fewer than € 10 million and a total balance sheet fewer than € 10 million is classified as a small enterprises. And, a business with a headcount of fewer than 10, a turnover fewer than € 2 million and a total balance sheet fewer than € 2 million is considered as a micro-business. Source: EC (2005:5)

The EC (2005:5) categorized SMEs as enterprises with fewer than 250 employees, annual turnover not exceeding € 50 million, and an annual balance sheet not exceeding € 43 million. However, in the U.S. the definition varies by sector based on the North American Industry Classification System (NAICS: https://www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf). The U.S. SBA provides a list of business size standards, matched to the NAICS codes. In manufacturing, for instance, an SME is defined as a business having 500 employees or less, but in a wholesale trade business it is 100 employees or less, and up to 250 employees for businesses involved in mining or silver.

To facilitate a consistent general classification of SMEs, the U.S. International Trade Commission (USITC, 2010) defined SMEs as "firms that employ fewer than 500 employees." It follows that, the European definition of SMEs is not universal. The definition widely varies according to countries policies, companies' revenues, number of employees, capital, turnover, market position, etc. In China, for instance, SMEs are defined as "different form of enterprises under different ownership that are established within the People's Republic of China that meet the social needs and create more job opportunities and comply with the industrial policy of the state" (World Trade organisation, 2014).

The European and the U.S. Stock Markets Specially Designed for SMEs and Their IPO Requirements

Capital raising or credit granting are often SMEs daunting challenge, especially in the start-up phase. In Europe SMEs access to finance went from 16% in 2009 to 7% in 2017, with the three most important sources of financing being: credit line (suitable for 53% of SMEs), leasing (for 48% of SMEs) and Stock

Market (for only 12 % of SMEs) (ECB, 2017). Stock markets aim to provide SMEs with a platform to raise funds. Research has stressed the existence of separate markets especially designed for SMEs (Canada, Denmark, Germany, Italy, Poland, Spain… etc.) with less stringent requirements than the main stock market. A few other studies reported no separate markets for SMEs and large firms in countries like Greece, Hungary, Romania, Slovenia …etc (OICU-IOSCO final report 2015).

Generally, enterprises go public through two types of stock markets. Either on a regulated market where securities are traded in a safe, standardized, faster and publicly transparent manner (large companies use those market to raise fund and trade their securities); or unregulated market where enterprises do not need to comply with the stringent listing requirement imposed in regulated markets, or when companies do not want to pay the high cost of being listed in those markets. Unregulated marked basically allow SMEs and Start-ups to trade their securities with less cost and less obligation to allow them to focus on their main business activities. However, fewer regulations also mean less public transparency, and therefore additional risk.

Unregulated Stock Markets in Europe

The Alternative Investment Market (AIM) was launched on 19th June 1995, in the UK, by the most reputed stock market in Europe, the London Stock Exchange. The goals was to help SMEs grow and raise the capital they need for expansion. AIM complies with the national law as well as some EC regulations, and issue specific notes for each listed company (AIM rules for companies 2018). It has financed over 3,600 companies across the world since 1995. Starting with a market volume of £82.2 million and a turnover of £270.2 million in 2017, its market volume has reached £104,763 million, with a turnover volume of £672,370.5 million. It has risen up to £105,443.37 million since 1995 (AIM Statistics - November 2017). AIM has become in recent decades, a reference and a model of stock markets, dedicated to SMEs and start-ups seeking for financial resources. There are three indexes maintained by the FTSE Group to measure AIM Group performances: the FTSE AIM UK 50 index, the FTSE AIM 100 index and the FTSE AIM All-Share index. With the same objectives of supporting SMEs, AIM Italia was created in 2010, after the merger between Borsa Italiana S.P. A (base in Milan it is the only Italian stock market) and LSE in 2007. Table 2 shows AIM and LSE listing requirements.

As an ongoing principle of financial disclosure, AIM enterprises must provide a half-yearly report and accounting. Any delay or default is subjected to suspension. Depending on the market capitalization, the admission fee for AIM may vary from £7,057 to £79,601, and the annual fee for each company is £5,899. Table 4 shows detailed ongoing listing requirements.

Created in 2000, Euronext NV is the European regulated stock exchange market, which is the largest in continental Europe with 1,300 issuers, representing €3.6 trillion market capitalization. Euronext NV daily cash average transaction volume peaked at €7.783 million with a yearly volume record of €18.524 million (Euronext, Dec. 2017). Euronext NV is located in headquartered in Amsterdam with offices in, Brussels, London, Lisbon, and Paris. It is the main trading center of the Euro-zone and its main listing indexes are CAC 40, PSI 20, AEX 20, BEL 20, etc. Euronext NV accounts unregulated markets: Table 3 shows Eronext listing requirements.

Table 2: The LSE and the AIM Listing Criteria

Conditions for Admission	**AIM**	**LSE Main List**
Floating capital	No minimum	Require a minimum of 25% shares owned by the public
Financial information	No history required	3years history
% of entity activities supported by income	No	75%
Control over the majority of assets of the entity (3 years)	No	Yes
Sufficient working capital	Yes	Yes
Market capitalization	No minimum	required £700,000
Profitability	No	No
Role of the advisors	Nomad required during the IPO and after	A sponsor
Admission documents	Admission documents under the responsibility of the Nomad	Admission documents reviewed by the UKLA

Table 2 summarizes enterprises listing criteria in the LSE and the AIM. This table shows that there is no prescriptive eligibility criteria to join AIM, however a company must appoint a nominated adviser(nomad), prepare an admission document in compliance with the AIM rules. However to join LSE main list, there are some prescriptive eligibility criteria such as a £700,000 minimum market capitalization, a 75% of entity activities supported by income, a 3 years financial information disclosure, a required minimum of 25% shares owned by the public. Source: London Stock Exchange https://www.nibusinessinfo.co.uk/content/requirements-joining-aim

Inspired by AIM, a new stock market, dedicated to SMEs at the European level, was created in 2005. Alternext, which became Euronext Growth in June 2017, was created by Euronext Paris and latterly joined by Euronext Brussels in 2006, Euronext Amsterdam and Euronext Lisbon in 2011. The goal was to help SMEs of the Euro-zone raise funds as as it became more expensive and harder for enterprises to access the Euronext NV. Euronext Growth all share Index (ALASI or ALASN) illustrates the performances of all the companies listed on Euronext growth. Enternext, created in 2013 as a branch of Alternext, is a pan-European program launched to boost SMEs equities, and to particularly give the Tech sector impetus.

The Free Market (Brussels, Lisbon, and Paris), which also become Euronext Access in June 2017, is a market particularly suitable for SMEs, wishing to increase their visibility and reputation through stock market, with less listing requirement compared to Alternext. With the same goals, a new compartment of Euronext Access called Euronext Access+ has also been designed to finance start-ups and fast-growing SMEs.

There is also a Capital Market Union (CMU), which is a plan launch by the European Union commission to unlock, mobilize and diversify the funding channels available to SMEs in Europe, strengthen the capacity of EU capital markets, and facilitate cross-border investment by 2019.

Table 3: Euronext Listing Requirements

Main Eligibility Criteria			
	Euronext European Regulated Markets	Alternext (Euronext Growth)	Free Markets (Euronext Access)
Free float	Minimum of 25% of share capital or 5% if this represents at least EUR 5 million	EUR 2.5 million (public offer)	Not Applicable (N/A)
Track record	Three years financial statements	EUR2.5 million (private placement within one year with a minimum of three investors) EUR 2.5 million (on another market) At least two years financial statements	Two years of financial statements recommended
Accounting standards	IFRS or equivalent accounting standards (including US, Canada, China and Japan)	EEA Company: IFRS or national GAAP	Optional IFRS or national accounting standards
Prospectus / Information Document	Prospectus approved by Competent Authority	Non-EEA Company: IFRS or equivalent accounting standards (in case of public offer) and IFRS, equivalent accounting standards (including US, Canada, China and Japan) or national accounting standards with reconciliation table (in case of private placement or direct listing)	Prospectus approved by the Regulator in case of a public offer

Table 3 summarizes enterprises listing criteria in the Euronext regulated and unregulated markets. This table shows that Euronext growth and Euronext access which are unregulated markets have lightened criteria compared to the main Euronext. While a free float of the Euronext requires a minimum of 25% of share capital or 5% if this represents at least € 5 million, the Euronext growth requires a € 2.5 million public offer, but the free float is not applicable to the Euronext Access; while the main Euronext requires at least a 3 years financial disclosure, it is at least 2 years with both Euronext growth and Euronext access; the main Euronext and Euronext Growth, require a compliance with the IFRS accounting standards, however, with the Euronext Access that condition is optional; and, the main Euronext, the Euronext growth and Euronext Access admission document are respectively under the responsibility of a competent authority, IFRS and the regulator. Source: Euronext https://www.euronext.com/fr/node/18959

Table 4: Ongoing Requirements

	Euronext European Regulated Markets	Alternext Euronext Growth	Free Markets (Euronext Access)
Financial Reporting	Audited annual and semi-annual financial statements Price sensitive information	Audited annual and semi-annual financial statements Price sensitive information	No reporting of periodic obligations Price sensitive information
Declaration of breaches of threshold	Multiple threshold declarations: Multiples of 5% of voting rights	Limited number of threshold declarations: 25, 30, 50, 75 and 95% of voting rights	No reporting of major holdings
Insider List	Yes	Yes	Yes
Declaration of Manager Transactions	Yes	Yes	Yes

Table 4 summarises enterprises ongoing listing requirements in the Euronext regulated and unregulated market. This table shows that an annual and semi-annual financial reporting is required with the main Euronext and the Euronext growth while it is not an obligation with the Euronext Access; while a reporting of major holdings is not required with the Euronext Access, multiples of 5% of voting rights is required by the main Euronext, and 25, 30, 50, 75 and 95% of voting rights is required by the Euronext Growth; meanwhile, an insider list and a declaration of manager transaction is required by the 3 markets. Source: Euronext listing/www.ban.be/Data/Documents/qlj3p286/28/Presentatie_VVDessel_2016.pdf

Beside the pan-European stock markets, there are national stock markets design for the promotion of SMEs, such as Deutsche Börse Group of Germany, MAB stock market (the Spanish AIM) of Spain, Alternative Market in Greece, the Irish Enterprise Exchange (launched by the ISE: the Irish Stock Exchange) of Ireland; Bern eXchange (BX) of Switzerland, OPEX stock exchange of Portugal and First North (Stockholm, Iceland and Helsinki).

Unregulated Stock Markets in the U.S.

Two-renowned national regulated stock markets in the U.S. are the NYSE and NASDAQ. With 10% of all securities trade in the U.S., NYSE America is the third largest stock market by trading volume, after the NYSE & NASDAQ. It is a branch of the NYSE. NYSE America is known to have flexible listing rules for U.S. small-cap companies, including foreign companies, mostly Canadian companies. The NYSE America's main indexes are XFI (NYSE American composite for financial subsector), XHL (NYSE American composite healthcare subsector), XID (NYSE American composite industrial subsector), XNA (NYSE American composite natural resources subsector), and XIT (NYSE American composite technology subsector). However, for a quick overall indicator of the NYSE American market, the XAX index is used (see Tabla 5 and Table 6)

Table 5: NYSE America IPO Listing Standards

	Standard 1	**Standard 2**	**Standard 3**	**Standard 4a**	**Standard 4b**
Pre-Tax Income	$750,000	n/a	n/a	n/a	n/a
Market Cap	n/a	n/a	$50 MM	$75 MM	n/a
Total Assets And Total Revenue	n/a	n/a	n/a	n/a	$75 MM
Market Value Of Public Float	$3 MM	$15 MM	$15 MM	20 MM	$20 MM
Stockholders' Equity	$4 MM	$4 MM	$4 MM	n/a	n/a
Minimum Price	$3	$3	$2	$3	$3
Operating History			2 YEARS		

Table 5 summarizes enterprises listing criteria in the NYSE America. For a firm to be listed on the NYSE America it is required to meet one of the above-mentioned standards and a minimum operating history of 2 years. Source: New York Stock Exchange

Table 6: NYSE America IPO Options

	Option 1	**Option 2**	**Option 3**
Public Share Holders	800	400	400
Public Float	500,000	1,000,000	500,000
Daily Trading Volume	n/a	n/a	200 Shares

Table 6 summarizes enterprises ongoing listing requirements in the NYSE America. And as an ongoing listing conditions, one of the above-mentioned option0s should be followed (option1, option 2 or option 3). Source: New York Stock Exchange

The U.S. unregulated stock markets or OTC (Over-The-Counter) Markets Group, which has its headquarters in New York City, is where securities are traded between two parties, without the supervision of an organized exchange market. Table 7 shows eligibility requirements for these markets. In this market, the security price is not necessarily published for the public. With a total securities of $US 15.2 billion, 10,347 of shares and a market volume of $ US 2.2 billion, OTCQX, OTCQB, and Pink companies represent 95% of the trade volume of the OTC market group. Apart from OTCQX which has rules including financial requirement, OTCQB and Pink Markets can include distressed, speculative as well as high-quality companies.

In the OTC market group the OTCQX listing criteria is divided into 2 groups (the U.S. local companies, and international companies). It has two tiers for U.S. companies' quotations: OTCQX U.S. & OTCQX U.S Premier, and two international tiers: OTCQX International & OTCQX International Premier. To be traded on these markets, companies must be registered with the U.S. security exchange commission (SEC), follow best practice of corporate governance, demonstrate compliance with U.S. security law, undergo an

audit and qualitative review by the OTC market group, and disclose financial information. SMEs can upgrade from OTCQB to OTCQX if they meet the above-mentioned requirements.

Table 7: OTCQX, OTCQB, and OTC Pink Markets Eligibility & Requirements

	OTCQX	**OTCQB**	**PINK**
ELIGIBILITY REQUIREMENT	Be listed on a Qualified Foreign Exchange or be an SEC Reporting Company	U.S. companies must have audited annual financials by a PCAOB auditor. (Regulation A Companies are exempt from the initial requirement)	N/A
	Not be a Shell Company or Blank-Check Company	Minimum bid price of $0.01	
	Not be subject to any Bankruptcy or reorganization proceedings	Not be in bankruptcy	
	Submit a Letter of Introduction from an OTCQX Sponsor	International companies must be listed on a Qualified Foreign Exchange (or SEC Reporting) and submit a Letter of Introduction from an approved OTCQB Sponsor	
REPORTING REQUIREMENT	SEC Reporting Standard	SEC Reporting Standard	based on the level of disclosure and public information made available by the company either through the SEC or posted on OTC market
	Regulation A Reporting Standard	Regulation A Reporting Standard	
	Alternative Reporting Standard	U.S. Bank Reporting Standard	
	Audited annual financials by PCAOB	International Reporting Standard	
	Timely disclosure of material news releases	Alternative Reporting Standard	
		Timely disclosure of material news	
CORPORATE REQUIREMENT	Have a board of directors that includes at least 2 Independent Directors	Have a board of directors that includes at least two Independent Directors	N/A
	Have an Audit Committee, a majority of the members of which are Independent Directors, and	Have an Audit Committee, a majority of the members of which are Independent Directors	
	Conduct annual shareholders' meetings and make annual financial reports available to its shareholders		
	at least 15 calendar days prior to such meetings.		
FEE	Application Fee: Non-refundable fee of $1,000 U.S.	Application Fee: $2,500	Application Fee: $500 U.S.
	Annual Fee: $1,000	Annual Fee: $10,000 per year ($12,000 effective January 1, 2018)	Annual Fee: $4200 U.S.
FINANCIAL STANDARD	refer to table 5	Non-SEC Reporting Companies: Disclosure must be posted for the prior two years	N/A
		SEC-Reporting Companies: Must be current in all periodic reporting requirements on EDGAR	

Table 7 summarizes enterprises listing criteria in the OTC markets Group (OTCQX, OTCQB, and PINK). This table shows that Pink has the least eligibility requirements followed by the OTCQB and the OTCQX gradually. Sources: OTC Markets.

OTCQB is a market for SMEs that are not yet qualified for the OTCQX market due to the fact that they are in the early stages of development. To be traded on the OTCQB market, companies must not be bankrupt, undergo an annual audit by the U.S. Public Company Accounting Oversight Board (PCAOB) auditor, comply with the $0.01 (one penny) bid price requirement, pay a one-time application fee of $2,500, and an annual fee of $10 000 per year. Pink companies that comply with the OTCQB requirements are allowed to upgrade from Pink to OTCQB.

The Pink OTC Market: has fewer or no financial requirements, no reporting standards and its quoted enterprises are not required to register with the SEC. Therefore, it is difficult for investors to find current and reliable information about those enterprises, which implies that Pink market firms are among the riskiest investment. The Pink OTC market is a member of the Financial Industry Regulation Authority (FINRA) and is registered with the SEC as a broker-dealer as an alternative trading system.

Despite some slight differences, unregulated markets have a number of characteristics in common including conditions of introduction and listing are less restrictive than regulated markets, especially in terms of eligibility (capital size, profitability, floating, etc.) listing fees, and financial disclosure. In the U.S. IPOs have helped several SMEs become giants (Amazon, E-bay, Yahoo, etc.). However, since the subprime crisis, listed companies in stock exchange markets have decreased (81%), and the SMEs IPO book runners' number has decreased from 162 in 1994 to 31 in 2014. However, at the same time it has seen a substantial growth in Europe and Asia (Weild and Kim, 2015).

DATA AND METHODOLOGY

For the empirical analysis, weekly adjusted closing historical index prices data of Euronext Growth All share index (ALASN) were collected. This is the biggest international unregulated stock market on European continent designed for SMEs. In addition, NYSE AMEX Composite Index (XAX) and OTCM ADR Index (OTCDR) were examined. Data runs from January 1st, 2013 to December 31st, 2017 including 261 observations. Weekly index prices were retrieved from www.investing.com. After calculating the average weekly return, the variance and the standard deviation of each index, these following tests were applied:

Augmented Dickey Fuller Test or Unit Root Test

A systematic change in the mean and variance of a time series causes models to give misleading results. In non-stationary series, the effect on indexes is observed to be permanent. This invalidates the efficient market hypothesis. For that reason, we tested the stationarity of the time series. The Augmented Dickey Fuller Test (ADF Test) is one of the most commonly used tests for the stationarity of a time series. The test is derived from the DF test developed by Dickey and Fuller in 1979 as follows:

$$\Delta y_t = (\rho - 1) y_{t-1} + u_t = \delta y_{t-1} + u_t \quad (1)$$

Δyt is the First difference of dependent variable (yt-yt-1). The Null hypothesis is that: $\delta = 0$

The error involved in the DF test may impair the co-variance hypothesis and may indicate heteroscedasticity or autocorrelation. To solve that problem, the DF model is modified by adding delayed values to the dependent variable, what led to the ADF model (Dickey and Fuller, 1981) as follows:

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^{\rho} \delta y_{t-1} + u_t \quad (2)$$

Two more models are created by adding intercept constant and trend variables to the model above. The time series used in ARCH and derivative analyses should not contain unit roots. Although the unit root entity is included in advanced stage models, it is useful to perform the unit root test first.

Exponential Generalized Autoregressive Conditional Heteroscedastic Model in Mean (EGARCH-M)

High returns mean high risk for financial investments. The Capital Asset Pricing Model explains the risk and returns relationship (Teynor, 1961-1962; Linter, 1965; Mossin, 1966; and Sharp, 1972). The standard GARCH model does not include the relationship between risk and return. Engle, Lilien and Robins Engle (1987) added this parameter. The models are called ARCH-M and GARCH-M. In ARCH-M and GARCH-M models, conditional variance is added to standard ARCH and GARCH models. Conditional variance is a measure of volatility in the series. The following equations specify an ARCH-M model.

$$r_t = \sum_{k=1}^{m} \lambda_k X_k + \varphi\sigma_t^2 + u_t$$

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{p} \alpha_i u_{t-1}^2$$

$$u_1 \sim N(0, \sigma_t^2)$$

$$u_{j,t} | F_{t-1} \sim N(0, \sigma_t^2) \quad (3)$$

rt: Risk premium in time t
xk: Exogenous variables
ut: Error term
δ2: Conditional variance

$$r_t = \sum_{k=1}^{m} \lambda_k X_k + \varphi\sigma_t^2 + u_t$$

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{p} \alpha_i u_{t-1}^2 + \sum_{i-1}^{q} \beta_i \sigma_{t-i}^2$$

$$u_1 \sim N(0, \sigma_t^2) \quad (4)$$

rt: Risk premium in time t
xk: Exogenous variables
ut: Error term
δ2: Conditional variance

The φ parameter refers to the response to changes in volatility. It is the part that adds the risk-return relation to the model. There is a usual belief that the bad news effect on a stock price is higher than the good news effect. In many markets, there is the presence of a negative correlation between the return at time t and volatility at t+n. From that point of view, the volatility decreases when the stock return increases and the volatility increase when the stock return decreases. This asymmetrical movement is called "leverage effect" (Black, 1976).

The standard GARCH model does not include the leverage effect. In his 1991 work, Nelson developed the EGARCH model by adding it. The EGARCH model is:

$$r_t = \mu + \sum_{i=1}^{p1} \alpha_i r_{t-i} + \sum_{i=1}^{p2} \beta_i u_{t-i} + u_t$$

$$\ln\left(\sigma_t^2\right) = \alpha_0 + \sum_{i=1}^{p} \beta_i \ln\left(\sigma_{t-i}^2\right) + \sum_{i=1}^{q} \alpha_i \left|\frac{u_{t-i}}{\sigma_{t-i}}\right| + \sum_{i=1}^{p} \gamma_i \frac{u_{t-i}}{\sigma_{t-i}} \quad (5)$$

rt: Risk premium in time t
ut: Error term
δ2: Conditional variance

The parameter γ in the equation is an indication of the asymmetric effect of the shocks. If the parameter is statistically significant and negative, it indicates that the effect of bad shocks is higher than good shocks. The EGARCH-M model appears when the first part of this model is added to the conditional variance term, with the φ parameter in the same section of the GARCH-M model. In this way, both the asymmetric effect of shocks and the risk-return relationship can be observed as long memory.

RESULTS

Table 8 shows summery statistics results from the collected data including the average returns, the standard deviation and the correlation. From the average returns, standard deviations and correlations, ALASN displays a higher return with less risk, compared to NYSE Amex and OTC ADR. A very weak uphill (positive) linear relationship is observed between the indexes.

Table 8: ALASN, NYSE Amex and OTC ADR Summery Statistics

Average return ALASN	0.262%
Average return XAC	0.063%
Average return OTCDR	0.129%
Correlation	r
Correl. ALASN,XAC	0.2416
Correl. ALASN,OTCDR	0.3605
Std dev ALASN	0.0159
Std dev XAC	0.0194
Std dev OTCDR	0.0175

This table presents the summery statistics results from the analysis of the collected data including the average returns, the standard deviation and the correlation.

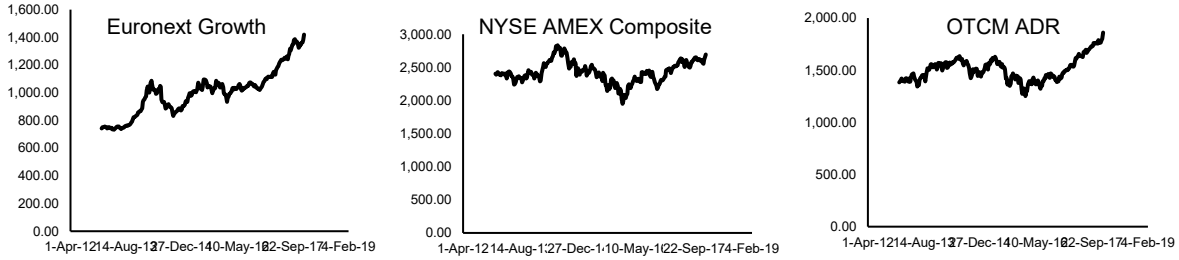
Return values of the series in the graphs appearing here a are calculated using the following formula:

$$r_t = \left(\frac{P_t}{P_{t-1}}\right) \quad (6)$$

rt: Return in time t
Pt: Stock market value at time t
Pt-1: Stock market value at time t-1

Figure 1 shows the return trends of ALASN, NYSE AMEX, and OTC ADR from 2013 to 2017.

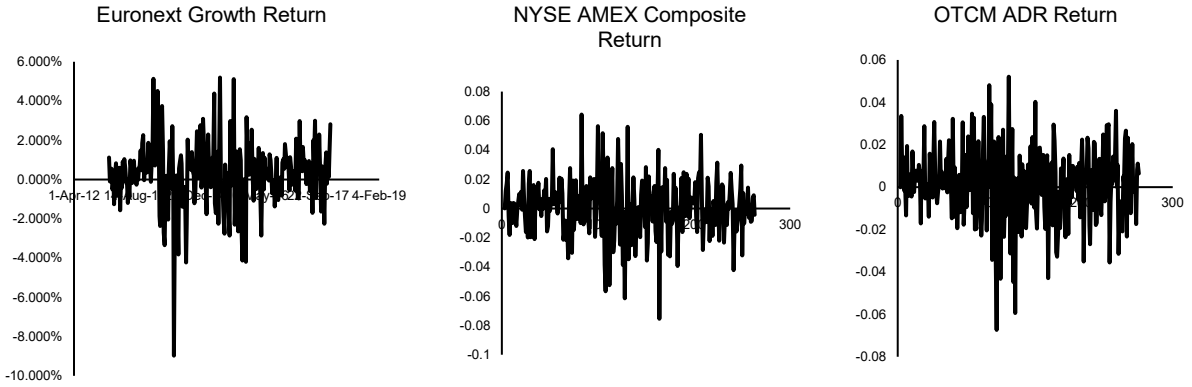
Figure 1: ALASN, NYSE AMEX, and OTCM ADR Index Prices



This figure shows the return trends of ALASN, NYSE AMEX, and OTC ADR from 2013 to 2017

Figure 2 shows the return trends of ALASN, NYSE AMEX, and OTC ADR from 2013 to 2017. The logarithmic chart of the Euronext All Share, despite a slight decline, shows an upward trend compared to its counterpart NYSE Amex and OTC ADR, which despite showing some upward trend in recent years, suffers from serious fluctuations. This indeed shows better results for the Euronext All Share, compared to NYSE Amex and OTC ADR. However, we see a slight decline in all three index prices around 2014, which may be caused by the unprecedented drop in oil prices (Mead & Stiger, 2015).

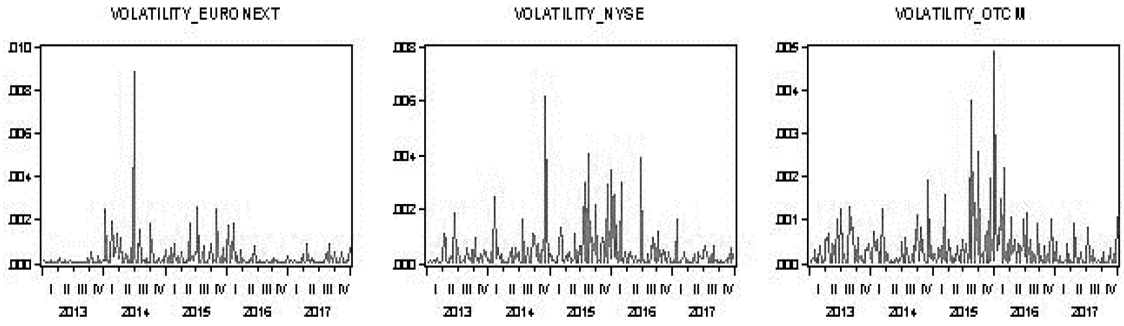
Figure 2: ALASN, NYSE AMEX, and OTCM ADR Indexes Returns



This figure shows the return trends of ALASN, NYSE AMEX, and OTC ADR from 2013 to 2017

Figure 3 shows the volatility trends of ALASN, NYSE AMEX, and OTC ADR from 2013 to 2017.

Figure 3: ALASN, NYSE AMEX, and OTCM ADR Indexes Volatilities



This figure shows the volatility trends of ALASN, NYSE AMEX, and OTC ADR from 2013 to 2017.

Econometrically, the upward trend indicates the time series is not stationary in expectancy. The persistent fluctuations show that it is not a stationary invariance. To test the stationarity of the return, the ADF test was applied. The results are presented in Table 9.

ADF results show that all series are stationary at level as all critical values are negative and the p values are less than 0.05. Thus, subsequent processes will include the Autoregressive Moving Average (ARMA) modelling rather than the Autoregressive Integrated Moving Average (ARIMA) modelling.

Table 9: ADF Test

Critical Value of EURONEXT	-6.742
Selected lag length2	3
Prob3	0.0000***
Critical Value of NYSE AMEX	-4.712
Selected lag length	13
Prob.	0.0001***
Critical Value of OTCM ADR	-6.571
Selected lag length	6
Prob.	0.0000***
H0: Series has a unit root Significance: ***0.01 **0.05 *0.1	
1: Intercept model 2: (Automatic - based on t-statistic, lagpval=0.1, maxlag=15) 3: MacKinnon (1996) one-sided p-values.	

Table 9 presents the ADF test results of the ALASN, NYSE AMEX, and OTCM ADR indexes. Lag Length: Selected lag length; H0: Series has a unit root; Prob. (p. value). 1: Intercept model 2: (Automatic - based on t-statistic, lag p. val=0.1, max lag =15) 3: MacKinnon (1996) one-sided p-values., **, and *** indicate the statistical significance at the 1 0, 5, and 1 percent level of significance, respectively. All critical values are negative with prob. Values <0.05*

EGARCH-M model and ARCH LM test results of the series are shown in Table 10. When the model was constructed, GARCH (1,1) model was used with reference to Hansen and Lunde's 2001 study.

From the EGARCH-M modelling results, no ARCH effect was observed. However, high volatility was observed in some periods, but the existence of permanent effects has not been observed in the long term. All γ coefficients in the models are significant and negative indicating the effects of positive and negative shocks on volatility are asymmetric, and there is the leverage effect. Negative shocks cause more volatility than positive shocks.

Table 10: EGARCH-M and ARCH LM Tests

EURONEXT			
	Parameters	Critical values	Prob.
α0	-8.763	-3.332	0.0009***
α1	0.3607	2.293	0.0218**
γ	-0.3200	-2.490	0.0128**
β1	-0.0241	-0.0078	0.9381
Significance: ***0.01 ** 0.05 *0.1			
ARCH-LM(1)			
F- statistic	0.0608	Prob. F(1,257)	0.8054
Obs*R-SQUARE	0.0613	Prob. Chi.Square(1)	0.8045
H0: Model does not have ARCH effect			
NYSE AMEX			
	Parameters	Critical values	Prob.
α0	-1.035	-2.195	0.0282**
α1	0.0105	0.1297	0.8969
γ	-0.1993	-2.841	0.0450***
β1	0.8715	14.990	0.0000***
Significance: ***0.01 ** 0.05 *0.1			
ARCH-LM(1)			
F- statistic	1.114	Prob. F(1,248)	0.2922
Obs*R-SQUARE	1.118	Prob. Chi.Square(1)	0.2903
H0: Model does not have ARCH effect			
OTCM ADR			
	Parameters	Critical values	Prob.
α0	-0.6463	-2.052	0.0402**
α1	-0.0819	-2.144	0.032**
γ	-0.2630	-3.999	0.0001***
β1	0.9148	23.128	0.0000***
Significance: ***0.01 ** 0.05 *0.1			
ARCH-LM(1)			
F-statistic	1.835	Prob. F(1,248)	0.1768
Obs*R-SQUARE	1.836	Prob. Chi.Square(1)	0.1754
HO: Model does not have ARCH effect			

*HO: Model does not have ARCH effect. Table 10 presents the EGARCH-M and ARCH LM test results of the ALASN, NYSE AMEX, and OTCM ADR indexes. α parameter represents a magnitude effect or the symmetric effect of the model, the "GARCH" effect; β measures the persistence in conditional volatility irrespective of anything happening in the market. The γ parameter measures the asymmetry or the leverage effect, the parameter of importance so that the EGARCH model allows for testing of asymmetries. If γ = 0 , then the model is symmetric. When γ < 0 , then positive shocks (good news) generate less volatility than negative shocks (bad news). When γ > 0 , it implies that positive innovations are more destabilizing than negative innovations. The F-statistic is an omitted variable test for the joint significance of all lagged squared residuals. The Obs*R-squared statistic is Engle's LM test statistic, computed as the number of observations times the from the test regression. Prob. Chi.Square(1)or "goodness of fit" statistic tests how likely it is that an observed distribution is due to chance. *, **, and *** indicate the statistical significance at the 1 0, 5, and 1 percent level of*

CONCLUSION

We investigated the state of SMEs using data from the U.S. and Europe. The goal was to compare the performances of both European unregulated markets, using the Euronext all share index, and U.S. unregulated markets, using the NYSE AMEX Composite Index and OTCM ADR Index.

Our theoretical study displayed the existence of various unregulated stock market for SMEs in Europe and the U.S. with diversified listing conditions that are less restrictive than principal regulated stock markets. The decision to go public is the result of a cost-benefit comparison.

SMEs' keen interest in the stock market based financing in recent years, results from the combination of factors, including IPO conditions, specificity and types of stock markets. SMEs' access to finance could be

improved, if decision makers in SMEs could separate management from ownership, lock off family succession and control, and hire professional staff to lead enterprises (Al. Barrak A. M., 2005). SMEs IPO's could improve, if policymakers paid more attention to SMEs, in establishing policies and accompanying measures. The empirical results revealed that, the Euronext all share index reflects better results for the European unregulated market, compared to its U.S. counterparts.

The non-inclusion of all the unregulated stock markets indexes prices of the two areas, coupled with limited duration of time, is a fundamental limitation for this study. However, this study opted for 2013 as a starting point, due to our desire to eliminate the 2008 global financial crisis' effects. The result could have been driven by poor performance of the U.S. unregulated market index prices, after the subprime crisis. For an overall comparison of the two markets, this study can be extended to the main listing stock markets.

REFERENCES

Akala, I. (2017). "The Euro-zone Financial Crisis: Causes, Consequences and Policy Responses" *International Journal of Youth Economy* Vol. 1, No. 2 (Nov. 2017), PP:121-134. doi:10.18576/ijye/010202.

AL.Barrak, A.M. (2005) "Initial public offering in Saudi arabia: motivation, barriers and effects" Newcastle library, 205 0617 8, thesis L7848.

Alvarez de la Campa, A. (2013) "Secured Transactions and Collateral Registries Program" Presentation at International Finance Corporation (IFC) conference, September 18, San Jose, Costa Rica.

Artzner, P., Delbaen, F., Eber, J.M., And Health, D. (1999) "Coherent Measures of Risk" *Blackwell Publishers, Mathematical Finance*, Vol. 9, No. 3. PP. 203–228. doi: 10.1111/1467-9965.00068.

Bharat Sreedhar, T. and Dittmar Amy, K. (2010) "Why Do Firms Use Private Equity to Opt Out Public Market?" *Review of Financial Studies*, vol. 23, no5, PP.1771-1818. doi:10.1093/rfs/hhq016

Boot, W.A., Gopalan, R.et Thakor, A. v. (2006) "The Entrepreneur Choice between Private and Public Ownership" *The journal of Finance*, vol. 61, no 2, Avril. doi: 10.1111/j.1540-6261.2006.00855.x.

Bremus Franziska, M. (2015) "*The Debate about Financing Constraints of SMEs in Europe*" *DIW Roundup: Politik im Fokus*, No. 66. doi: 10419/111851.

Chemmanur Thomas, J., and Fulghieri, P. (1999) "A Theory of Going Public Decision" *The Review of Financial Studies,* vol. 12 No. 2 (summer 1999) PP. 249-279.

Chod, J. and Lyandres, E. (2010) "Strategic IPOs and Product Market Competition" *Journal of Financial Economics.* doi:10.1016/j.jfineco.2010.10.010.

Dickey, D. A., & Fuller, W. A. (1979) "Distribution of the estimators for autoregressive time series with a unit root" Journal of the American Statistical Association. doi:10.1080/01621459.1979.10482531.

Dickey, D. A., & Fuller, W. A. (1981) "Likelihood ratio statistics for autoregressive time series with a unit root" *Econometrica*: *Journal of the Econometric Society* vol. 49, No. 4..

Posner, E. (2009) "The Origins of Europe's New Stock Markets" *Harvard University Press.*

Engle, R. F., Lilien, D. M., & Robins R. P. (1987) "Estimating time varying risk premia in the term structure: The ARCH-M model" *Econometrica: Journal of the Econometric Society*, PP. 391-407. doi: 10.2307/1913242.

Episcopos, A., & Davis, J. (1996) "*Predicting returns on Canadian exchange rates with artificial neural networks and EGARCH-M models*" *Neural Computing & Applications*, 4(3), PP. 168-174. doi:10.1007/BF01414877.

Farre-Mensa, J. (2010) "Why are Most Firms privately held?" *Job Market Paper*.

Ghalanos, A. (2013) "*Does anything NOT beat the GARCH(1,1)*" Retrieved from http://www.unstarched.net/2013/01/07/does-anything-not-beat-the-garch11/

Glosten, L. R., Jagannathan, R., & Runkle, D. E. (1993) "On the relation between the expected value and the volatility of the nominal excess return on stocks*" The journal of finance*, 48(5), PP. 1779-1801.

González-Rivera, G., Lee, T. H., & Mishra, S. (2004) "Forecasting volatility: A reality check based on option pricing, utility function, value-at-risk, and predictive likelihood" *International Journal of Forecasting*, 20(4), PP. 629-645. doi:10.1016/j.ijforecast.2003.10.003.

Gupta, V., Saini, J.S. (2016) "IPO Financing: An alternative source of financing for SMEs in current era" *Journal of Business and Management*. Volume 18, Issue 7 .Ver. IV (July 2016), PP. 119-125. doi: 10.9790/487X-180704119125.

Hansen, P. R., & Lunde A. (2001) "A comparison of volatility models: Does anything beat a GARCH (1, 1*)" Centre for Analytical Finance, University of Aarhus*, Working Paper Series, 84.

Hansen, P. R. (2010) "A winner's curse for econometric models: on the joint distribution of in-sample fit and out-of-sample fit and its implications for model selection*" Research Paper*, 1-39.

Hansen, P. R., Lunde, A., & Nason, J. M., (2011) "The model confidence set" *Econometrica*, 79(2), PP. 453-497. Doi: 10.3982/ECTA5771.

Hall, C. (2007) "When the dragon awakes: Internationalisation of SMEs in China and implications for Europe" *CESifo Forum*, Vol. 08, Iss. 2, PP. 29-34.

Jeet, P. & Vats, P. (2016) "Learning quantitative finance with R. PACKT Books" *Packt Publishing, Birmingham*, UK.

Kentaro, I. (2016) "A panel study of zombie SMEs in Japan: Identification, borrowing and investment*" Journal of the Japanese and International Economies* Volume 39, PP. 91-107. doi: 10.1016/j.jjie.2015.12.001.

Kiškis, M., Limba, T., & Gulevičiūtė, G. (2016) "Business value of intellectual property in biotech SMEs: case studies of Lithuanian and Arizona's (US) firms" *Entrepreneurship and sustainability issues*, 4(2), PP. 221-234. doi: 10.9770/jesi.2016.4.2(11).

Mead, D. and Stiger, P. (2015) "The 2014 plunge in import petroleum prices: What happened?" *U.S. Bureau Of Labor Statistics* May 2015. Vol. 4 / No. 9.

Mossin, J. (1966) "Equilibrium in a capital asset market" *Econometrica: Journal of the Econometric Society*, 768-783.

Nelson, D. B., (1991) "*Conditional heteroskedasticity in asset returns: A new approach.* Econometrica" *Journal of the Econometric Society*, PP. 347-370.

Olugbode, M., El-Masry, A., & Pointon, J., (2014) "Exchange rate and interest rate exposure of UK industries using first-order autoregressive Exponential GARCH-in-mean (EGARCH-M) approach*" The Manchester School*, 82(4), PP. 409-464. doi:10.1111/manc.12029.

Pagano M., (1993) "The Flotation of Companies on The Stock Market: A Coordination Failure*" European Economic Review*, vol. 37, no 5, PP. 1101-1125. doi:10.1016/0014-2921(93)90111-M.

Pierre, E. F. S. (1998) "Estimating EGARCH-M models: Science or art*" The Quarterly Review of Economics and Finance*, 38(2), PP. 167-180. doi:10.1016/S1062-9769(99)80110-0.

Pozniak, L. and Guillemette, F. (2013) "Les Dirigeants De PME Et La Communication Financière Sur l'Internet*" Revue international P.M.E: Economie et Gestion de la Petite et Moyenne Entreprise*, vol.26, no 3-4, PP.139-167. doi: 10.7202/1024522.

Rayhorn, C., Hassan, M. K., YU, J. S., & Janson K. R. (2007) "Emerging market efficiencies: New Zealand's maturation experience in the presence of Non-Linearity, thin trading and asymmetric information*" International Review of Finance*, 7(1-2), PP. 21-34. doi: 10.1111/j.1468-2443.2007.00066.x.

Reschenhofer, E. (2013) "Does Anyone Need a GARCH(1,1)" *Journal of Finance and Accounting*, 1(2), PP. 48-53. doi: 10.12691/jfa-1-2-2.

Revest, V. and Sapio, A. (2014) "L'alternative Investment Market: Un Modèle Pour Le Financement des Petites Et Moyennes Capitalisations? " *Revue D'économie Financière*. Doi : 10.3917/ecofi.114.0167.

Sannajust, A. (2014) "Impact of the World Financial Crisis to SMEs: The determinants of bank loan rejection in Europe and USA*"* working paper PP. 2014- 324 IPAG Business School.

Sharpe, W. F. (1964) "Capital asset prices: A theory of market equilibrium under conditions of risk*" The Journal of Finance*, 19(3), 425-442. doi: 10.1111/j.1540-6261.1964.tb02865.x.

Shmueli, G., & Lichtendahl, K. C. (2016) "Practical Time Series Forecasting with R: A Hands-On Guide" *Axelrod Schnall Publishers*.

Shumway, H. & Stoffer, D. S. (2011) "*Tim*e series analysis and its applications: With R examples*"* *Springer,* Doi: 10.1007/978-1-4419-7865-3.

Delporte J.M., SPF Economie, P.M.E. (2017) "*Classes moyennes et Energie, Tableau de bord des PME et des entrepreneurs indépendants"* [PDF] Retrieved from https://economie.fgov.be/fr/publications/tableau-de-bord-des-pme-et-des-0

Sthoughton, Neal M.,Wong, Kit P., and Zechner, J.,(2001) "IPOs and Product Quality*" Journal of Business.* vol. 74, no 3, pp. 352-388. Doi: 10.1086/321931.

Udell Gregory F. (2015) "Issues in SME Access to Finance Issues in SME Access to Finance" Retrieved from http://european-economy.eu/leading-articles/issues-in-sme-access-to-finance-by-gregory-f-udell/

Wagenvoort, R. (2003) "Are finance constraints hindering the growth of SMEs in Europe?" *European Investment Bank (EIB*) . Volume: 8 Issue PP. 23-50. doi: 10419/44823.

Wehinger, G. (2013) "SMEs and the credit crunch: Current financing difficulties, policy measures and a review of literature OECD*" Journal: Financial Market Trends* Volume 2013/2

Weild, D. and Kim, E. (2015) "Why Are IPOs in the ICU*?" Grant Thornton LLP*. [PDF] Retrieved from http://cmapartners.com/wp-content/uploads/2011/04/Why-are-IPOs-in-the-ICU_11_19.pdf

Zingales, L., (1995) "Insider Ownership and the Decision of Going Public" *Review of Economic studies*, vol. 62, PP. 425-448.

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