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# The Credit Defaults of CDOs: An Investigation of Securitization in Offshore Financial Centers

## **Abstract**

Collateralized debt obligations (CDOs) have been subject to much scrutiny with the financial crisis. In fact, while other U.S. asset-backed securities are typically issued domestically, a majority of CDOs are issued in offshore financial centers such as the Cayman Islands, Ireland and Jersey rather than in the United States. This paper investigates the legal, regulatory and economic implications of issuing CDOs offshore, and whether offshore issuance of CDOs had an impact on the packaging of the underlying securities and CDO credit defaults. Using a dataset of 517 CDOs, three main findings were made. First, the country of issuance significantly explains the losses in the CDO collateral. Second, lack of reporting requirements for offshore-issued CDOs played a role in CDO credit defaults. Third, there was no evidence that the fact that offshore vehicles are bankruptcy-remote played a role in credit rating inflation and in explaining the proliferation of collateral defaults offshore.

## **Keywords**

Credit defaults, CDO, Offshore

## **Disciplines**

Business

**The Credit Defaults of CDOs:  
An Investigation of Securitization in Offshore Financial Centers**

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**Research Discipline:** Business

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## **The Credit Defaults of CDOs:**

### **An Investigation of Securitization in Offshore Financial Centers**

#### **Abstract:**

Collateralized debt obligations (CDOs) have been subject to much scrutiny with the financial crisis. In fact, while other U.S. asset-backed securities are typically issued domestically, a majority of CDOs are issued in offshore financial centers such as the Cayman Islands, Ireland and Jersey rather than in the United States. This paper investigates the legal, regulatory and economic implications of issuing CDOs offshore, and whether offshore issuance of CDOs had an impact on the packaging of the underlying securities and CDO credit defaults. Using a dataset of 517 CDOs, three main findings were made. First, the country of issuance significantly explains the losses in the CDO collateral. Second, lack of reporting requirements for offshore-issued CDOs played a role in CDO credit defaults. Third, there was no evidence that the fact that offshore vehicles are bankruptcy-remote played a role in credit rating inflation and in explaining the proliferation of collateral defaults offshore.

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## **Introduction**

Despite the prominence of securitization activity in the United States, when it comes to collateralized debt obligations (CDOs), a large majority are created offshore; with a dominant share in the Cayman Islands. 97.9% of CDOs in a representative sample of vintage 2004-2007 CDOs were issued in offshore financial centers such as the Cayman Islands, Ireland and Jersey, rather than in the United States. As the CDO market faced write-downs during the credit crisis of 2007, losses in the collateral assets backing offshore-issued CDOs exceeded losses from US-issued CDOs by \$31,253,310 per tranche on average.

Could the offshore CDO issuances explain the proliferation of high investment grade, high credit risk CDOs? In an attempt to provide some answers, this paper investigates CDO defaults in relation to their country of issuance, and expands on the CDO arranger's rationale behind offshore issuance of the CDO securities. Using a hand-collected dataset of 517 CDOs of vintage 2004 to 2007 from Pershing Square Capital Management's Open Source Model, supplemented by data from various other sources, a quantitative analysis is conducted to investigate the relationship between collateral defaults and the country of issuance of a CDO, providing for the effects of other CDO characteristics.

The results suggest that the country of issuance significantly explains the credit quality of the underlying collateral of CDO securities. Moreover, the results of regressions of collateral defaults against capital ratios of CDO sponsoring banks suggest that lack of reporting requirements for offshore-issued CDOs played a role in CDO credit defaults. This finding concurs with the US government which implemented new regulations on offshore securitization vehicles after the financial crisis. In particular, the 2010 Dodd-Frank Act changed the landscape of offshore CDO regulation by mandating the holding of part of the credit risk of offshore

transactions in the balance sheets of the CDO arrangers, and making provisions for withholding taxes on CDO transactions.

The structure of the paper is as follows. The first part of the paper provides the necessary background on the CDO market. It describes the CDO securitization process, the typical CDO structure, the rationale for offshore issuance of CDOs and the credit defaults in the CDO market during the credit crisis starting 2007. The second part elaborates on the research thesis of the paper and hypothesis development. Thirdly, the methodology of the quantitative analysis is explained, after which results of the analysis are described, followed by a discussion of the results. The paper ends with some conclusions, providing explanations of the limitations of the analysis and recommendations for future research.

## **Background: the CDO Market**

### *Securitization and CDOs*

Securitization is a process by which one entity pools together different loans and/or receivables, transfers the claims on the future assets' cash flows to another entity that is created for the purpose of holding the claims, and uses the cash flows to pay back the other entity's investors, with or without the assistance of other credit<sup>1</sup> (Fabozzi and Kothari 2007). There is a wealth of academic research regarding the securitization of assets. Asset securitization was developed in the 1980's as a means of credit risk transfer<sup>2</sup> (Lucas, Goodman and Fabozzi 2007) and is instrumental for structured finance. It is one of the main forms of financing for companies, partly because it allows disintermediation by selling assets directly to the capital markets instead of

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<sup>1</sup> See "The CDO Structure" in this paper.

<sup>2</sup> Basically, by selling its loans or receivables to another party, an entity can transfer its credit risk.

going through financial institutions (Schwarcz 2013, 131-132). Before the 2008 financial crisis, Minton, Sanders and Strahan (2004) mentioned that financial institutions enjoyed a number of advantages in securitizing their assets; including lower financial distress costs to reduce the cost of debt, and the avoidance of capital requirements. In fact, securitization was widely regarded as an efficient way of carrying out transactions for the originators of the securities (Lupica 1998, 597). Among securitization transactions, the market for mortgage-backed securities (MBS), home equity ABS (HELOCs and HELOANs), retail ABS and collateralized debt obligations (CDO) swelled in volume from around \$400 billion in 1998 to \$1.7 trillion in 2006 (Cetorelli and Peristiani 2012, 51).

### *The CDO Structure*

The process of securitizing assets using a CDO structure is described thus. The holder of a pool of cash flow-generating assets<sup>3</sup> first creates a special purpose vehicle (SPV)<sup>4</sup>. According to Gorton and Souleles (2007), the SPV is sometimes legally set up as a trust. Essentially a “brain-dead” company created for the sole purpose of holding the assets, the SPV has no employees or building at its registered location. Instead, it has a trustee which performs its administrative functions. A CDO manager is also employed to select and sometimes manage the collateral portfolio. Once established, the SPV buys the assets from the holder, financing them typically by issuing CDO notes. The notes are "backed" by the assets since the noteholders are paid interest and principal from the asset cash flows. Figure 1 illustrates the intricate relationships in a typical CDO structure in the case of a collateralized bond obligation (CBO).

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<sup>3</sup> Including loans and receivables

<sup>4</sup> Also known as a special purpose entity (SPE)

The CDO is often "packaged" from a pool of different assets of varying credit risks. An ABS CDO is a CDO backed by ABS whose underlying assets are typically mortgage loans, home equity loans, credit card loans or auto loans. In contrast, CBOs and collateralized loan obligations (CLO) are backed by corporate bonds and whole loans respectively. Some CDOs are packaged with other CDOs; these are known as CDO squared. At the opposite of cash CDOs<sup>5</sup>, synthetic CDOs are backed by credit derivatives such as CDS that provide asset exposure<sup>6</sup> instead of transacting the actual assets. Figure 2 shows the proportion of vintage 2004-2007 CDOs by underlying collateral. "Structured finance" includes a basket of collateral types such as corporate bonds and loans and emerging market debt. Synthetic CDOs sponsored by financial institutions were the most significant deal type. The synthetic CDO presented challenges in its pricing model since the standard single-factor normal copula framework required assumptions about its correlation with assets, and since base correlations sometimes failed to explain tranche pricing (Finger 2004, 8-14).

To reflect the varying credit risk of the underlying assets, the CDO is "sliced and diced" under a waterfall structure with CDO "tranches" of varying seniority. The highly rated senior tranches are paid before the mezzanine tranches, after which the lowest equity tranches are paid (Duffie and Garleanu 2001, 41). Accordingly, each tranche is often rated by credit rating agencies. Table 1 breaks down the credit ratings of CDO tranches between 2004 and 2007 by seniority. On average, 73% of CDO tranches were rated A3/A- or above by Moody's, Standard & Poor's and Fitch ratings. 20% of high grade tranches were rated Baa1/BBB+ or lower. An alarmingly significant proportion of mezzanine tranches were rated with the highest Aaa/AAA rating,

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<sup>5</sup> Called cash CDOs because they are backed by cash flow-generating assets

<sup>6</sup> Exposures include corporate credit risk and exposures to residential mortgage-backed securities, commercial mortgage-backed securities, CDO tranches, and other structured finance securities (Gibson 2004, 1)



specifically 34.4%, 34.3% and 32.9% of mezzanine tranches for Moody's, Standard & Poor's and Fitch ratings respectively.

The securitization process previously explained can further vary among CDOs since some transactions securitize only part of the assets' cash flows, use credit enhancements such as Credit Default Swaps (CDS) or overcollateralization to ensure high credit ratings, enlist the help of securitization service providers, or require different legal obligations depending on the CDO's legal structure. The SPV can also be established in the US or in an offshore financial center such as the Cayman Islands or Jersey, which have different contextual implications for the CDO.

### ***Rationale for Offshore Issuance of CDOs***

Cetorelli and Peristiani (2012, 52) claim that 73% of private asset-backed issuance (including credit card ABS, auto ABS, MBS, home equity loans HELOAN, home equity line of credit HELOC, CMBS and CDO's) was created in the US by 2008 and the remaining one-fourth was offshore, mainly in the Cayman Islands where CDO issuance surged, especially synthetic CDOs. Indeed, while MBS, credit card and auto ABS securitizations lean towards local US issuance, CDOs tend to use offshore SPVs (Moser and Williams 2010, 161). If an offshore SPV is used for US securitization, often a second US corporation will be established (usually in Delaware) to co-issue the debt securities. Table 2 shows the volume of asset-backed issuance by country, including auto, credit card, student loan ABS, residential and commercial MBS, HELOANs, HELOCs and CDOs. Figure 3 illustrate the proportion of US-traded CDOs that were issued in the US or offshore by financial institution sponsoring the CDO. Financial institutions chose to issue CDOs in the Cayman Islands most of the time, including the German WestLB and

Dresdner bank, the British Royal Bank of Scotland, and the Swiss Credit Suisse. Only 2.1% of CDOs in the sample were issued in the US.

What advantages would originators and investors gain by securitizing SPVs in offshore financial centers? Belmontes (2004, 36) identifies four main motivations in establishing SPVs offshore.

### *Tax Neutrality*

First, the SPVs are often incorporated in a tax-neutral jurisdiction. Essentially, tax neutrality involves the elimination of tax leakage<sup>7</sup> through corporate tax in the country of the SPV incorporation and in the country of the underlying collateral portfolio, or through withholding taxes on the SPV's payments and receipts. In the US, securitization transactions are often structured as trusts. Because it is more difficult for a CDO transaction to legally qualify for a grantor trust<sup>8</sup> as CDO collateral are often actively managed, practically all CDOs are structured as corporations in low-tax jurisdictions (Carden and Nasser 2007, 120). An SPV will not be subject to US federal income taxes if properly established offshore as a SPV not engaged "in US trade or business". This may occur by relying on Section 864's safe harbor which states that stock or security trading does not constitute a trade or business with the US (Carden and Nasser 2007, 122). Typically, tax-neutral jurisdictions provide some significant tax benefits. The Cayman Islands allows CDOs to incorporate as 'exempted companies'<sup>9</sup> which benefit from a tax holiday of twenty years, with a possible extension of ten additional years (Gorton and Souleles, 2010). Jersey also has an 'exempt company' rule, to be renewed yearly, whereby beneficiaries

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<sup>7</sup> For more information on motivations based on tax leakage, see Tavakoli, J.M. 2004, 55-57.

<sup>8</sup> A grantor trust is one where the grantor pays income tax, while the trust is exempt for taxation purposes

<sup>9</sup> This is possible only if the SPV does not do business in the country of incorporation, in this case the Cayman Islands.

do not pay any withholding tax, capital gains or stamp duties (Belmontes 2004, 37). Unlike the no-tax Cayman Islands and Jersey jurisdictions, Ireland is a nominal tax jurisdiction. An Ireland-issued SPV can qualify for Section 110 which ensures that the SPV is treated in a tax-neutral way (Arthur Cox 2012, 1-3). While profits are taxed, the cost of funding and expenditures are usually tax-deductible. There are no stamp duties in Ireland, and exemptions are available to Section 110 SPVs for withholding taxes and Value Added Tax. Minimal tax leakage is essential for an efficient CDO structure, and therefore the tax advantages provided by offshore financial centers are extremely valuable.

### *Bankruptcy Remoteness*

Second, offshore financial centers are legally recognized and widely accepted as providers of bankruptcy-remote vehicles. Under bankruptcy remoteness, if an SPV's sponsor becomes bankrupt or insolvent, the sponsor's creditors cannot seize the SPV and its assets. This requires the SPV to engage solely in securitization transactions, requires that the sale of the assets not be framed as a loan to the SPV, and that the risk of SPV consolidation with the sponsor be minimized. To satisfy such requirements, offshore financial centers allow the establishment of a bankruptcy-remote vehicle in the form of an "orphan" SPV not owned or controlled by the sponsor. Limited recourse and non-petition covenants are usually included to prevent any investor from bringing the SPV to courts for bankruptcy or insolvency. In theory, bankruptcy remoteness enables sponsors to create investment grade CDO securities based solely on the credit quality of the collateral, irrespective of the sponsors' financial profile. Indeed, bankruptcy remoteness was a significant factor of consideration for credit rating agencies (Conyers Dill and Pearman 2013, 12-13). Credit enhancements could boost the SPV's ratings above the CDO

sponsor's rating, thanks to the bankruptcy remoteness of the SPV. However, CDOs were often repackaged with other structured ABS, and sometimes with other CDOs, making it hard to trace back correlations to different assets, and therefore hard to judge the overall credit quality of the CDO. Bankruptcy-remote vehicles are also off-balance sheet entities from the viewpoint of the sponsor. Arnold (2009) discussed the role of accounting practices in the treatment of off-balance transactions. It is in the 1980's that US accounting standards allowed banks to move securitized assets from their balance sheet to the books of an off-balance sheet entity. This created a way for banks to avoid complying with accounting rules and regulatory capital standards. In fact, the selling of collateral to the SPV enabled banks to remove loans from their books and therefore lower their capital requirements so that more loans could be made (Barnett-Hart 2009, 7).

#### *Professional Securitization Services*

Third, experienced service providers can assist in setting up an SPV efficiently in an environment where such incorporations are common. As David Lloyd of Bell Rock Group explained of his working field, service providers provide expertise in establishing the SPV, corporate services such as registered office, resident and qualified directors and compliance services during the life of the SPV, which sometimes amounts to up to 20 years. Because of the prevalence of securitization transactions in these financial centers, it is also easy to find law firms and trustee services which are able to provide expertise in the securitization process.

#### *Ease and Speed of SPV Set-Up*

In the Cayman Islands, an SPV can be set up in as little as 24 hours under a charitable trust or a STAR trust. This is significantly faster than other offshore jurisdictions (Belmontes 2004, 40).

Offshore financial centers also often have a supportive legal infrastructure that is familiar with securitization transactions so actions may be easily enforced in the courts. Cayman Islands SPVs have to register an office and maintain a register of directors, officers and shareholders, but are not required to file financial reports or provide audited financial statements.

Irish SPVs are set up pursuant to the Companies Act, and must be structured a public limited company if funds are to be raised from the public (Thorne and Houlihan 2002). Publicly issued CDOs required a minimum capitalization of 38,100 as of 2002, but none for a private issue. The CDOs are recorded with the Irish Companies Registration Office.

In Jersey, the Jersey Financial Services Commission (JFSC) must approve the identity of the sponsor/arranger before the SPV can be set up, in accord with efforts to maintain Jersey's reputation as a premier finance center (Hollywood and Hunter 2015, 2-3). There is no minimum capitalization requirement. The CDOs may be listed on a recognized stock exchange, and a register of members, directors and registered office are required.

In contrast, US regulations on the establishment of an onshore SPV depend on the legal type of business which the SPV is structured. For instance, business trusts and LLCs are typically registered with the secretary of state or similar authority (Moser & Williams 2010).

Depending on investor demand, the CDO securities can be issued on a public offering or opt for a Rule 144a private issue directed exclusively to qualified institutional buyers. The securities can also be sold under Regulation S to investors outside the United States. Publicly issued securities are not listed on a regulated exchange in the US, but a registration statement must be filed to the US Securities Exchange Commission (SEC) and the SEC's Regulation AB and related rules relating to shelf registrations of ABS must be complied with. There are no share capital requirements for listing securities on a US public exchange. After the financial crisis, under

Section 942 of the 2010 Dodd-Frank act, all issuers must now report standardized information on the assets backing the CDO (SEC 2014). Moreover, prospectus disclosure requirements now include the sponsor's retained economic interest in the CDO and financial information about parties obligated to repurchase assets.

### ***CDO Credit Defaults***

Even before the financial crisis, CDOs had captured attention when downgrades of Ford's and General Motors' debt led to significant losses for CDO investors in 2005 (Longstaff and Rajan 2008). When the CDO market crashed during the credit crisis, CDOs saw over \$542 billion in write-downs in the 2007-2008 timespan (Barnett-Hart 2009, 3). Figures 4 and 5 indicate the volume of collateral losses in billions of dollars and as a percentage of the tranche collateral and cash value for vintage 2004-2007 CDO tranches. The CDO collateral packed by UBS and Merrill Lynch had the greatest value of defaults at \$219 billion and \$233 billion respectively, representing almost half of all collateral defaults in the 2004-2007 vintage CDO market<sup>10</sup>. Yet UBS and Merrill Lynch were not the worst issuers in terms of proportion of collateral defaults; over 50% of the value of CDO tranches arranged by the Royal Bank of Scotland and Morgan Stanley was lost in collateral defaults.

Many authors opine that the CDO market meltdown was in large part responsible for the financial crisis. Crotty (2009) discussed how CDOs' credit risk transfer mechanism failed during the financial crisis because banks issuing CDOs often retained the CDOs they created<sup>11</sup>. Acharya and Richardson (2009) argued that placing securitized assets in off-balance-sheet entities and lower capital requirements on AAA-rated CDO tranches had led CDO-sponsoring banks to take

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<sup>10</sup> The total sum of defaults amounted to about \$1.265 trillion in this sample

<sup>11</sup> See Crotty 2009, 568-569 for the reasons behind the holding or 'warehousing' of CDOs by banks

advantage of significantly lower capital buffers, with banks holding about 50% of the CDO market<sup>12</sup> made up of AAA-rated tranches backed by subprime loans. This led to a concentration of the risk of collateral defaults within banks, which magnified the effects of the housing crash and contaminated the financial system. Barnett-Hart (2009) investigated CDOs in the financial crisis and concluded that poorly constructed CDOs, irresponsible underwriting practices and inadequate credit rating models contributed to the CDO market meltdown. On the other hand, many others agree with Richards' view that financial innovation such as CDOs is not a primary explanation for the financial crisis (Richards 2013). To this day, there is no consensus about whether CDOs have caused the collapse of the financial system in 2008, but this paper sets the debate aside to focus on the offshore CDO market.

## **Research Thesis**

The goal of this paper is to investigate the credit defaults of CDOs set up offshore as opposed to defaults of CDOs set up domestically. The domination of offshore CDO issuance is curious. Why would banks issue CDOs offshore when they can do so domestically? At first look, issuing securities domestically may seem like a more obvious choice due to familiarity with the domestic legal system, regulatory controls, economic and business environment, and the ability to build on established domestic business relationships. Most asset-backed securities, including MBS, auto and credit card ABS are in fact typically issued in the US (Moser and Williams 2010; Cetorelli and Peristiani 2012), but the vast majority of CDOs are issued offshore. In relation to the CDO market meltdown of 2008, a preliminary analysis of collateral defaults using data from Bloomberg and the *Open Source Model* of Pershing Square Capital Management reveals that, on average, collateral losses from offshore vintage 2004-2007 CDOs exceeded losses from US-

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<sup>12</sup> Representing \$749 billion worth of CDO tranches (Acharya and Richardson 2009, 202)

issued CDOs by \$31,253,310 per tranche. Moreover, for every \$1 of a tranche's current face value, a US-issued CDO would on average incur collateral losses of \$2.31, compared with \$3.41, \$2.75 and \$ \$4.43 losses for Cayman-, Ireland- and Jersey-issued CDOs. Were Cayman and Jersey CDOs priced too low for their credit risk? On average, both in terms of percentage of collateral loss per tranche and in terms of total amount of losses per CDO, Cayman CDOs displayed the highest collateral defaults while Jersey CDOs displayed the lowest defaults. The details are shown in Table 3. Thus, the statistics seem to suggest that CDO credit quality differed by their country of issuance.

Opinions on offshore financial centers, popularly known as 'tax havens', are often controversial because of their aggressive no-tax schemes, freedom from legal hassle in creating "empty" companies and trusts, and freedom from accounting reporting requirements (McCann 2006). The issues raised by critics of these centers included poor disclosure requirements, lack of regulatory oversight and unfair tax competition leading to the creation of toxic 'financial innovations', nourishing 'fraudulent practices' and facilitating global financial shock contagion. After the financial crisis, several regulations were put in place to address securitization by offshore vehicles: the Dodd-Frank Act of 2010 requires that originators of ABS retain at least 5% of the risk of the ABS; the Foreign Account Tax Compliance Act (FATCA) requires offshore vehicles to report to the IRS the financial accounts held by US taxpayers or foreign entities in which the US taxpayers are majority owners; the FASB revised accounting rules on the sale of financial assets and consolidation of certain off-balance sheet entities; the SEC has more comprehensive registration, disclosure and reporting requirements that extend to offshore entities with business in the US; and FATCA as part of the Hiring Incentives to Restore Employment Act imposes a 30% withholding tax on foreign financial institutions, including CDOs (Kopp and



Kim 2009; Kayle, Walker and Brassel 2012, 3-5; Flock, Smith and Evans 2013). This paper tests the notion underlying these new regulations: that there needs to be more regulatory oversight over bankruptcy-remote entities, more transparent reporting standards and that cash flows from offshore SPVs should be taxed. The analysis could be helpful not only for US policymakers dealing with offshore securitization, but also for offshore financial centers as they evolve their own regulatory controls.

Given the CDO market meltdown during the credit crisis of 2007, could the offshore CDO issuances explain the proliferation of high investment grade, high credit risk CDOs which may have contributed to the \$524 billion of CDO write-downs by 2008? Despite the abundant literature available on the topic of asset securitization and offshore finance, to my knowledge, there is no empirical study investigating this question. In an attempt to provide some answers, this paper conducts an analysis of the credit defaults of offshore-issued and US-issued CDOs during the credit crisis. My hypotheses can be broken down into the following:

***Hypothesis 1:***

Legislation regarding bankruptcy remoteness in offshore financial centers led to overvaluation of high credit risk CDOs by credit ratings agencies and relying investors, leading to a proliferation of CDO collateral defaults in the market. Bankruptcy remoteness was an important feature for credit rating agencies in assigning ratings to CDOs as it allowed CDOs to receive higher ratings than the sponsors themselves, since the SPVs were delinked from the sponsor's credit risk. Institutional investors of the CDOs usually relied on the credit ratings in their investment decision while the agencies were incentivized to give high ratings because their business grew with the growth of the highly rated, high yield CDOs (Barnett-Hart 2009, 7-8).

***Hypothesis 2:***

Lack of reporting requirements in both offshore financial centers and in the books of CDO sponsors led to misvaluation of risks by the CDO investors, creating disproportionate demand for high credit-risk, high-yield CDOs and causing collateral defaults in offshore CDOs. In offshore centers, reporting requirements were often non-existent or toned down in the local accounting regulations. For the sponsors, CDOs were considered off-balance-sheet items according to accounting standards because of their bankruptcy-remote status. Thus, their risks were not reported in the books of the sponsors. This may have encouraged banks to create CDOs to lower their capital requirements<sup>13</sup>.

***Hypothesis 3:***

Tax advantages for offshore CDOs allowed sponsors to create high yield CDOs without any transaction cost penalties, encouraging the proliferation of lower credit quality, high yield CDOs for profit-seeking rather than financing purposes, and causing greater amounts of collateral defaults on offshore CDOs. In addition to avoiding the US federal income taxes, nominal or no taxes imposed on CDOs issued offshore meant that little or no transaction costs were levied on CDO transactions and cash flow transfers to and from the US. This changed with a withholding tax implemented in 2012 under FATCA as CDOs are now considered ‘financial institutions’ for tax purposes (Walker and Brassel 2012, 3).

***Hypothesis 4:***

The existence of professional securitization services offshore facilitated efficient and conflict-free CDO transactions. By providing expertise in compliance, structuring and administration of SPVs, offshore service providers have an independent oversight role in the securitization process,

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<sup>13</sup> See the topic ‘Bankruptcy Remoteness’ of this paper

since they usually have no affiliation with investment managers, law firms, trustees, prime brokers or auditors, nor do they hold investments, to avoid conflicts of interest. Unlike the other hypotheses, this would mean that offshore CDOs would be more efficiently priced relative to their risks than US-issued CDOs, and lower collateral defaults in offshore CDOs would be expected.

## **Methodology**

For the analysis, data was hand-collected from various sources and includes a sample of 517 CDOs with detailed tranche-level information on collateral defaults from the *Open Source Model* dataset of Pershing Square Capital Management. This was supplemented by other CDO characteristics data from Bloomberg and Barclays Capital Live, as well as bank CDO arranger data from the BvD BankScope dataset of the Wharton Research Data Services (WRDS). To test for the effects of the country of issuance on CDO performance, I perform a number of regressions of various dependent variables representing credit defaults against variable describing the CDO's country of issuance and variables representing various CDO characteristics at the tranche level. The initial regression model is the following:

$$\text{Default}_i = \alpha + \beta_1(\text{Country of issuance}) + \beta_2(\text{Number of tranches}) + \beta_3(\text{Year}) + \beta_4(\text{Average credit rating score}) + \beta_5(\text{Deal type}) + \beta_6(\text{Current face value}) + \beta_7(\text{Coupon}) + \beta_8(\text{Lead manager}) + \varepsilon_i$$

*Default* is a variable describing the credit CDO performance. Tables 4 and 6 present the regression results when using the value of the collateral losses per tranche in the CDO as *Default* variable. Tables 5 and 7 present the results using as dependent variable the percentage of the

collateral value that has defaulted per tranche. *Country of issuance*, *Year*, *Deal type* and *Lead manager* are categorical variables describing the country where the SPV was set up and where CDOs were issued, the vintage year of the CDO, the type of collateral underlying the tranche, and the CDO arranger/sponsor, respectively. Average credit rating score is a numerical average of the credit ratings of Moody's, Standard & Poor's and Fitch ratings, according to the credit ratings translation table provided on the *Open Source Model* dataset, with 1 being the highest rated and 22 the lowest possible rating. *Current face value* is an estimate of the CDO's face value. *Coupon* describes the CDO's coupon rate by the average 1-month, 3-month or 6-month US LIBOR rate for the CDO's pricing year, plus the premium added for each tranche.

Tables 4 and 5 present the results of models testing for the effects of the country of issuance of a CDO on the CDO's credit performance, after isolating for the effects of various CDO characteristics described in the empirical analysis of the CDO market meltdown conducted by Barnett-Hart (2009). As a robustness check, three estimates of collateral losses are used in three separate regressions and the results are compared. Tables 6 and 7 show the results for models testing for the hypotheses previously proposed to explain differences in CDO credit defaults between offshore-issued and US-issued CDOs. Specifically, the models evaluate the country-specific determinants of CDO performance for every country where the 2004-2007 vintage CDOs in the sample were issued.

## **Results**

Essentially, the results of Table 4 and 5 indicate significant statistical evidence of differences in CDO credit defaults depending on the country of issuance of the CDOs. The F-statistic for all regressions indicates that the model is useful in explaining variances in the dependent variable at

the 1% significance level. The R-squared for the three regressions in Table 4 show that the model explains about 43-44% of the variation in the collateral default variable.

The models in Table 5 explain the variation in percentage of collateral defaults at around 44-54%.

The CDO characteristic variables corroborate several research papers on CDO defaults. First, in all cases, a greater number of tranches, representing thinner tranches more likely to be wiped out from single asset defaults, on average increases collateral losses by \$60-70 million at the 1% significance level, and increases the percentage of collateral losses to total collateral value of a tranche by 2.20-2.52%. The average rating score were significant in most regressions but small, indicating higher ratings associated with higher losses, indicating the inadequacy of credit ratings as CDO noteholders of investment grade securities suffered greater collateral losses. Some models also indicate a statistically significant association of year 2007 vintage CDOs with higher default values, possibly indicating the effects of the 2007 housing crash on CDO mortgage collateral. The complexity of the CDOs probably had an effect on collateral losses through the mispricing of high risk CDOs; this is reflected by the statistical significance of CDO squares and synthetic CDOs in the models. Finally, the lead manager of the CDO seemed to matter somewhat in explaining CDO performance, suggesting there were some idiosyncratic effects attributed to the CDO arranger, such as the level of due diligence, on the CDO credit quality.

The variable of interest, *Country*, is statistically significant for all regressions at the 5% significance level (see Table 8 for Wald tests), even after controlling for other effects. When using the 2<sup>nd</sup> and 3<sup>rd</sup> estimations of collateral losses, US-issued CDOs on average had higher collateral losses than Cayman-issued CDOs by \$120 million. Jersey- and Ireland-issued CDOs, on the other hand, faced \$150-270 and \$50-60 lower collateral losses than Cayman-issued CDOs on average, respectively. From Table 5, the percentage collateral loss of US-issued, Ireland-

issued and Jersey-issued CDO tranches were 12.11%<sup>14</sup>, 10.6-14.31% and 3.52-3.58% lower than the percentage for Cayman-issued CDOs respectively, significant at the 1%.

The results of Tables 6 and 7 indicate that, controlling for CDO characteristics, there is significant evidence that banks with lower initial Tier 1 capital ratios were associated with higher collateral losses for Cayman-issued CDOs at 5% significance level and for Jersey-issued and US-issued CDOs at 1% level. Similarly, banks with lower Tier 1 capital ratios were associated with higher percentage of collateral loss per tranche for Jersey-issued, Ireland-issued and US-issued CDOs at the 1% significance level. Moreover, evidence suggests that the coefficient for the average rating score is zero. The one exception is the Cayman Islands, where higher credit ratings were associated with higher collateral losses; specifically, a rating score higher by 1 increased collateral losses by \$10 million. The R-squareds for the country-specific regressions are very high at above 70% of the variance in the dependent variable explained. The only exception is the regression for the Cayman Islands at 0.43<sup>15</sup>.

## **Discussion**

The analysis reveals that there are in fact differences in the credit quality of CDOs depending on where they were issued. In general, all other CDO characteristics remaining the same, CDO tranches from the Cayman Islands faced the greatest average percentage of losses in their underlying collateral, followed by Ireland, US and Jersey CDOs. In terms of the magnitude of collateral losses per CDO tranche, the 2<sup>nd</sup> and 3<sup>rd</sup> regressions of Table 4 show that US CDOs on average have the highest losses, followed by Cayman, Ireland and Jersey CDOs. Thus, US CDOs sustained the higher collateral losses, but relative to the total value of the collateral plus

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<sup>14</sup> Using the 1<sup>st</sup> estimation of collateral losses

<sup>15</sup> After comparing the Cayman Islands model with and without *Lead Manager* as an independent variable, the latter variable was added to the regression model because it increased the R-squared significantly from 0.36 to 0.43, indicating the usefulness of this variable in explaining collateral defaults in the unique case of Cayman CDOs.

cash in the CDO tranche, the proportion of losses was not as bad as in the Cayman Islands and Ireland. The collateral underlying US CDO tranches may have been greater in value than the offshore-based collateral, leading to greater collateral losses in the US, but the proportion of collateral losses per tranche reveals that the offshore-issued CDOs, with the exception of Jersey CDOs, were the worse credit performers relative to their collateral portfolio than US-issued CDOs. This would rule out Hypothesis 4 which proposed that independent offshore professional securitization services from service providers facilitated the market for conflict-free, transparent transactions, reducing the infestation of bad credit-quality collateral in tranches which were for the majority rated as investment grade.

The regressions in Tables 6 and 7 test for the hypotheses 1 and 2. Hypothesis 1 suggests that higher collateral defaults in offshore financial centers were caused by overvaluation of high credit risk CDOs by credit ratings agencies. The latter were able to bestow CDO ratings higher than ratings of its arranger thanks to the bankruptcy remote feature of the SPV, achieved by the specific legal structure put in place in offshore centers. Given Hypothesis 1, one should expect the proxy for credit ratings to be statistically significant in separate country-specific regressions (based on the CDO country of issuance) of CDO collateral defaults. Namely, the coefficient for the *Average rating score* variable would show a negative relationship with the Default variable as a higher rating would be associated with higher collateral defaults in the ‘Overvaluation’ hypothesis. This proves not to be the case. Only the Cayman Islands regression shows an association of the credit ratings to collateral losses. Moreover, the relationship is positive rather than negative, indicating for instance that downgrading the ratings from AAA to AA+ (ratings score from 1 to 2) increases collateral losses by \$10 million. This suggests that credit ratings agencies in fact did not miscalculate the Cayman CDOs’ credit risk as proposed by Hypothesis 1.

In Hypothesis 2, lack of reporting requirements for offshore vehicles encouraged banks with low capital ratios to securitize their risky loans to meet capital requirements, leading to a misvaluation of CDO risks by investors, creating disproportionate amounts of bad-quality, high yield CDOs on the market and causing collateral defaults in offshore CDOs. If the hypothesis were true, country-specific regressions would show that banks with low initial Tier 1 capital ratios would arrange CDOs which would ultimately have higher collateral defaults. Tables 6 and 7 indicate that there is a negative relationship between *Tier 1 capital ratio* and the default variables, corroborating Hypothesis 2. Curiously, the coefficient is positive at the 1% significance level in the case of the Cayman Islands regression. This could just be a reflection of the fact that by issuing CDOs in the Cayman Islands, banks increased their capital ratios. The Tier 1 capital ratio variable is taken from 2000-2003 data on bank capital ratios. It is important to note that, unlike the other offshore centers where the CDO issuance activity is relatively new, the Cayman Islands have been a site for CDO securitization since 1994 (Walkers 2006). To more accurately model the link between initial capital ratios and country-specific collateral defaults, capital ratios from 1994 and before would be ideal for the model. However, data on historical regulatory capital ratios for this time period are hard to find.

## **Conclusion**

This paper investigated the effects of the characteristics of different jurisdictions where CDOs are issued on the credit defaults of the CDOs. A thorough comparison of offshore and onshore CDO securitization was conducted, followed by a quantitative analysis of the credit quality of CDOs in relation to their country of issuance. Based on the results, there is evidence to suggest that the country of issuance significantly explains the credit quality of the securities beyond other



CDO characteristics. Moreover, the initial capital ratio of banks is significant in explaining the default variables in regressions, suggesting that lack of reporting requirements played a role in CDO credit defaults. Finally, we find no evidence of overvaluation in CDO securities due to misleading credit ratings on CDOs with low credit-quality collateral.

A number of limitations restricted the paper's analysis. First, the data was limited in size by the time period of the sample and by the attribution of a Committee on Uniform Security Identification Procedures (CUSIP) number for each tranche in the data collection process. If the sample included CDO data after the implementation of the withholding tax by FATCA (specifically, after 2012), the tax hypothesis could have been tested in a more robust way by comparing credit defaults before and after 2012. Moreover, CDOs are not always attributed a CUSIP and therefore a better sample size could be obtained if another identifier was available in our dataset. Second, the capital ratio data were not always reported in datasets, especially those data points before the financial crisis for non-bank financial institutions such as Goldman Sachs and Lehman Brothers as investment banks. Third, the thesis of this paper could be extended to other subsets of CDOs such as CLOs and CBOs that were not investigated in this analysis, and other CDO characteristics could have been explored. Several other features of CDO were used in past research to explain CDO defaults, including the number of underlying assets in the CDO, or the number of credit ratings downgrades before default, which this paper failed to analyze due to lack of data availability.

This paper provides a starting groundwork on a topic which has been little investigated in academic research, namely the question of the CDO issued offshore rather onshore and its economic, legal and regulatory implications on the CDO's credit risk. The analysis confirms that the selection of the jurisdiction for CDO issuance mattered in explaining differences in collateral

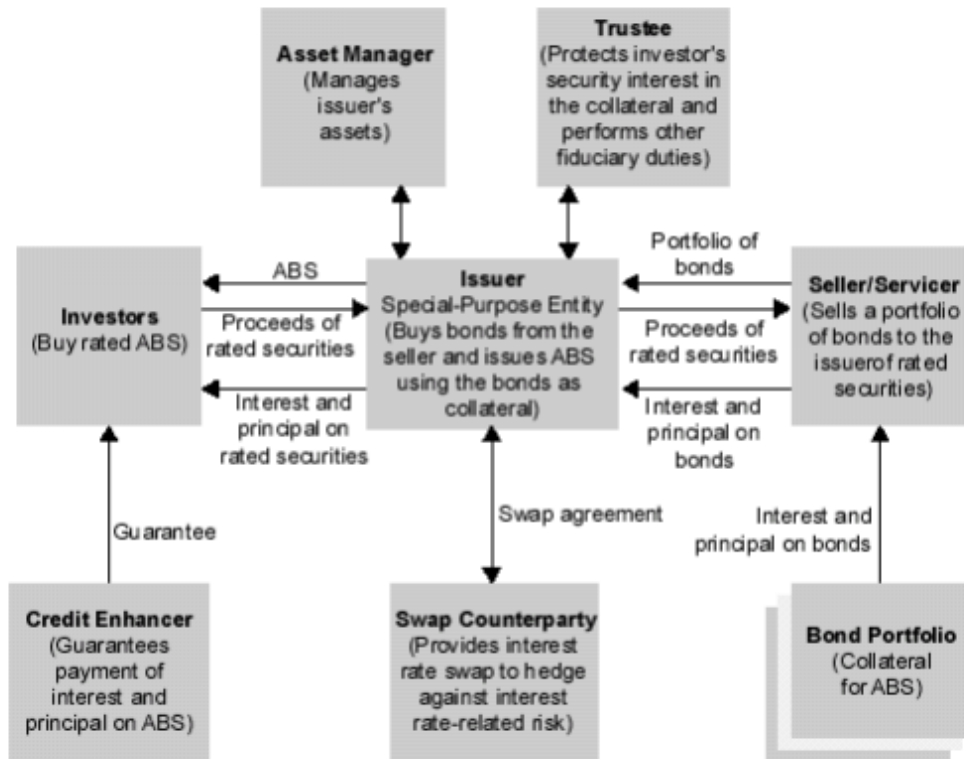
defaults of the underlying CDO assets. However, results appear to disprove the notion that offshore vehicles' bankruptcy remoteness played a role in credit rating inflation and in explaining the proliferation of collateral defaults offshore. The finding that capital ratios were associated with the defaults of CDOs issued in a specific jurisdiction seems to suggest that the US government is in the right direction by implementing regulations that should shed light into the lack of reporting requirements in CDO transactions. In particular, the 2010 Dodd-Frank Act was a significant step forward in changing offshore CDO regulation, including not only the holding of part of the credit risk of offshore transactions in the balance sheets of the CDO arrangers, but also provisions for withholding taxes on some offshore vehicles. It would be interesting to look into the credit quality of offshore versus onshore-issued CDOs before and after the full implementation of the Act in a future study.

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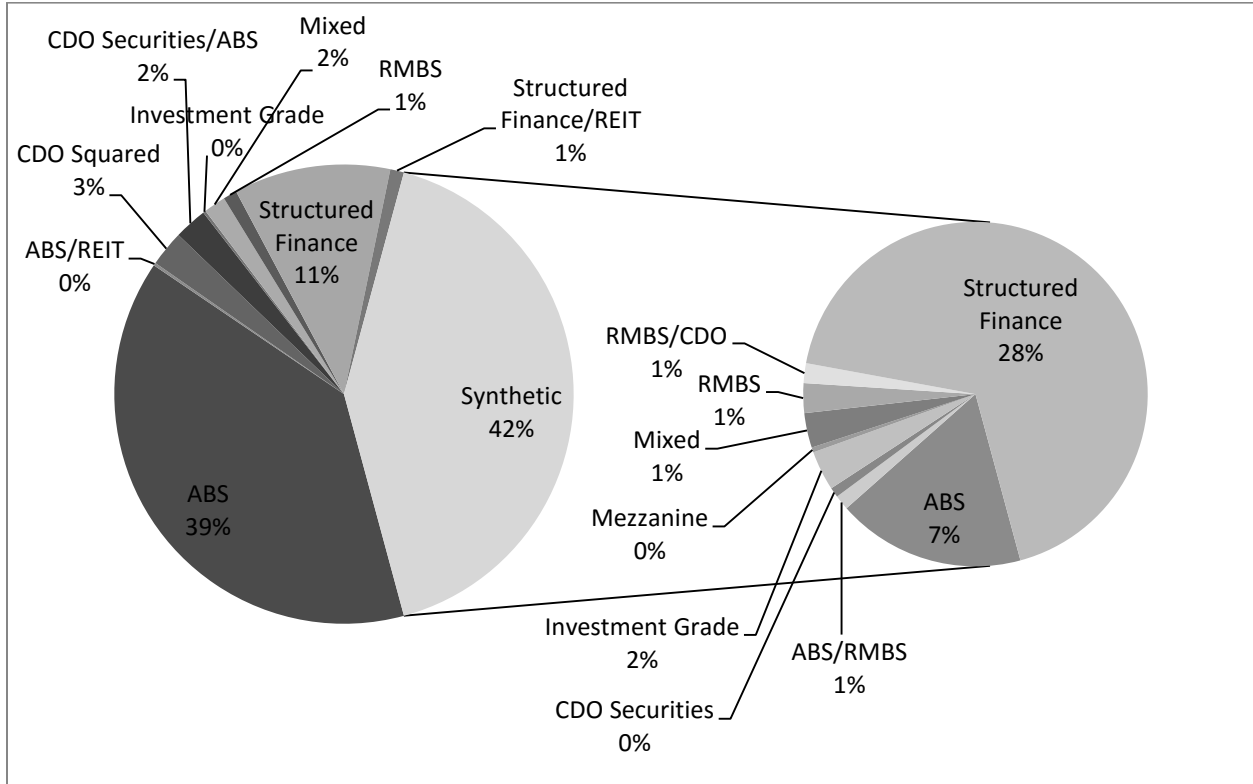
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**Figure 1: The Typical CDO Structure**



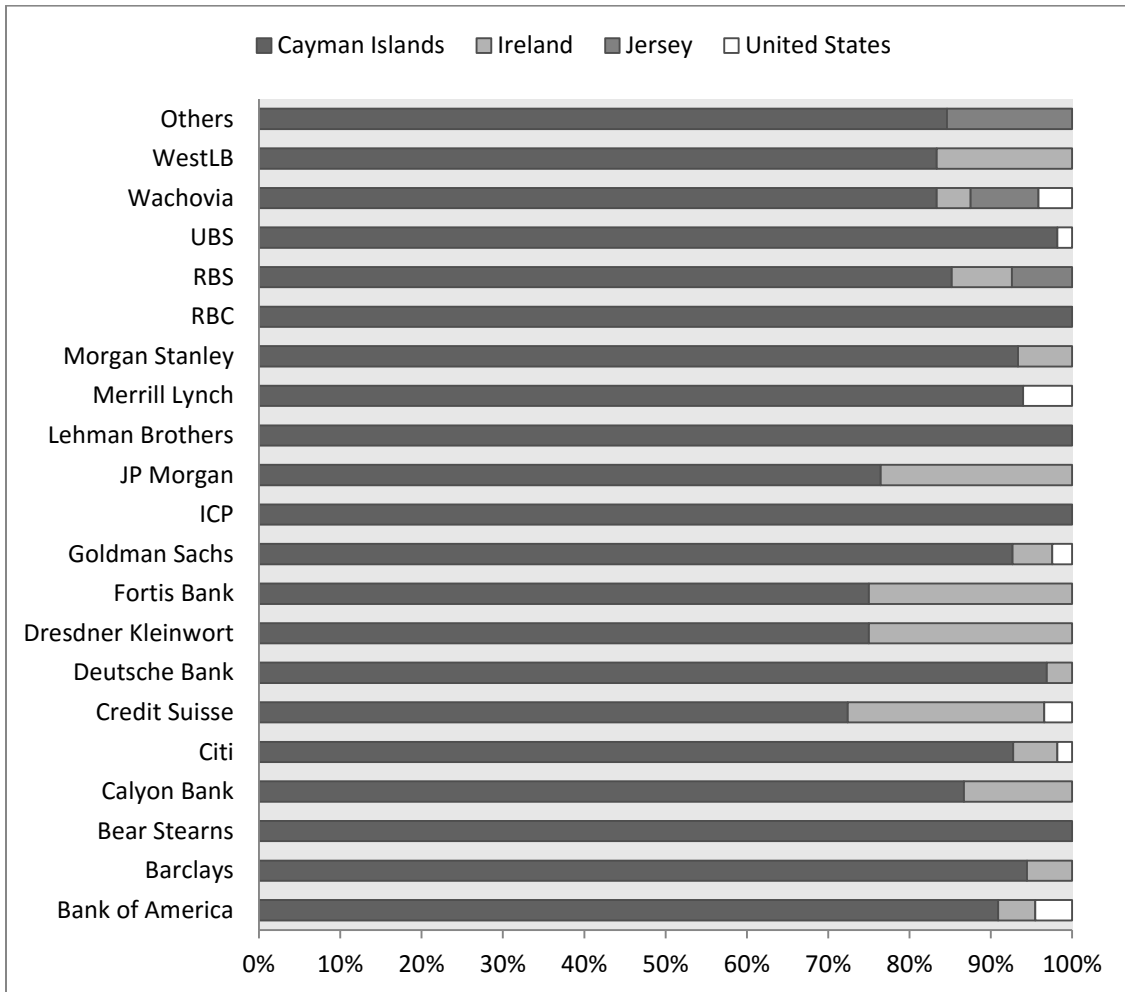
Source: NYU Stern: "the CDO Product".

**Figure 2: CDO Collateral**



Sources: Open Source Model; Bloomberg L.P.

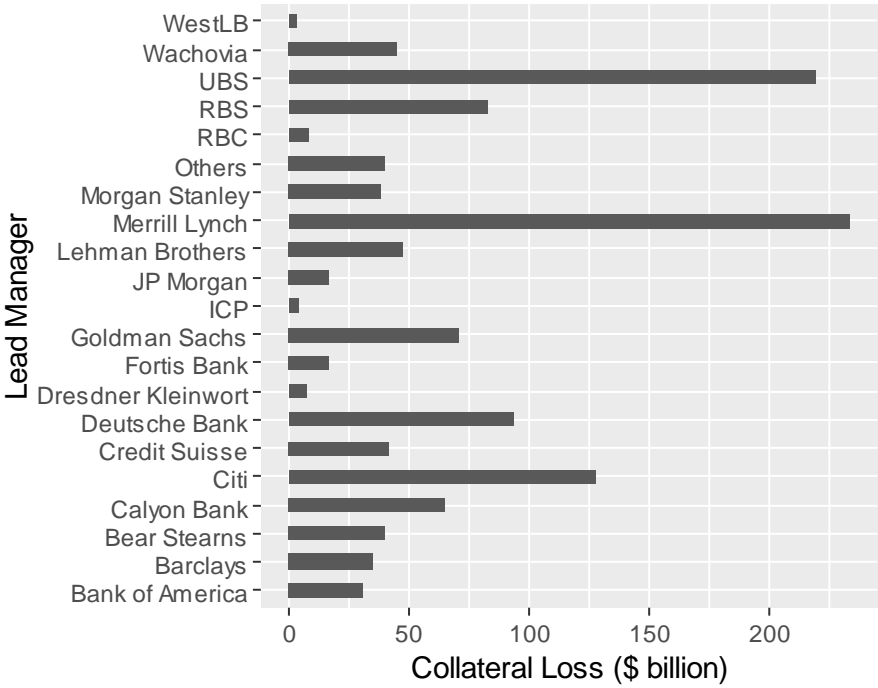
**Figure 3: Percentage of CDO Issuance  
by Country of Issuance and by Lead Manager**



Source: Bloomberg L.P.

Note: “Lead Manager” refers to the commercial or investment bank that has primary responsibility for organizing the issuance. “Others” include banks such as Société Générale, underwriters such as RSUI Group, and sponsor partnerships such as the Barclays Capital and Merrill Lynch co-sponsorship for the LIBERTY HARBOUR CDO 2005-1.

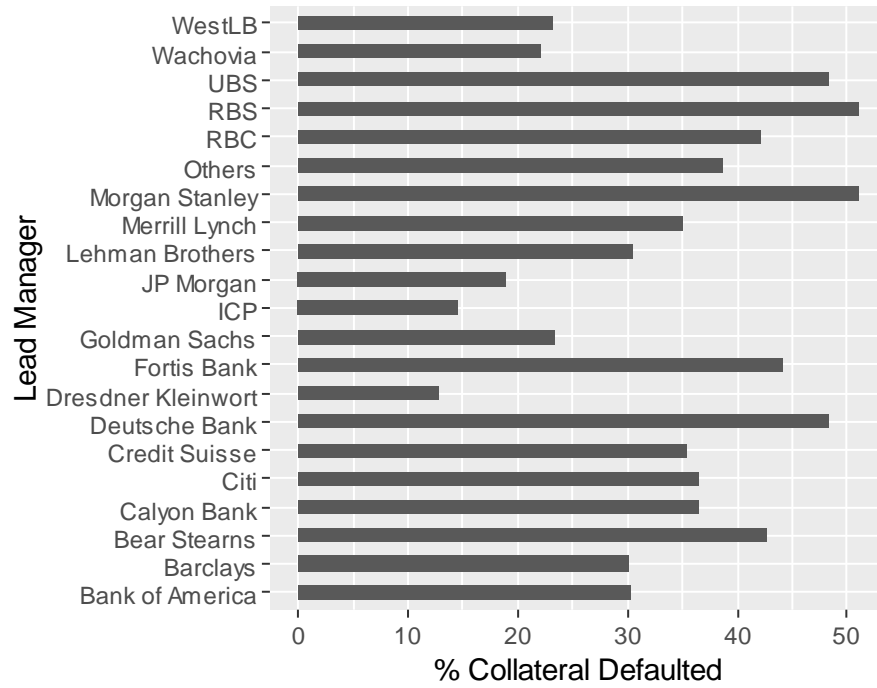
**Figure 4: CDO Collateral Losses by Lead Manager in Billions of Dollars, Vintage 2004-2007**



Source: Bloomberg L.P.; Open Source Model.



**Figure 5: CDO Collateral Losses by Lead Manager as a Percentage of Tranche Value, Vintage 2004-2007**



Sources: Bloomberg L.P.; Open Source Model.

**Table 1: Credit Ratings by Tranche, CDO Vintage 2004-2007**

Moody's			S&P			Fitch			Total
Rating	High Grade	Mezz	Rating	High Grade	Mezz	Rating	High Grade	Mezz	
Aaa	530	646	AAA	526	689	AAA	72	147	2610
Aa1	12	24	AA+	7	11	AA+	2	6	62
Aa2	172	280	AA	178	313	AA	19	72	1034
Aa3	36	56	AA-	32	52	AA-	9	15	200
A1	12	18	A+	9	12	A+	1	3	55
A2	139	254	A	146	272	A	14	59	884
A3	47	51	A-	34	56	A-	4	14	206
Baa1	7	41	BBB+	3	38	BBB+	1	6	96
Baa2	160	277	BBB	167	309	BBB	25	74	1012
Baa3	17	95	BBB-	12	109	BBB-	2	21	256
Ba1	30	74	BB+	29	74	BB+	4	12	223
Ba2	23	47	BB	16	65	BB	0	17	168
Ba3	6	9	BB-	2	4	BB-	0	0	21
B3	1	1	B	0	4	B	0	1	7
<b>Tranches rated</b>	<b>1192</b>	<b>1873</b>		<b>1161</b>	<b>2008</b>		<b>153</b>	<b>447</b>	<b>6834</b>

Source: Open Source Model.

**Table 2: Volume of Asset-Backed Issuance by Country, 1983-2008**

<b>Country</b>	<b>Volume (\$ billion)</b>	<b>Share (%)</b>
United States	7,089	73.1
Cayman Islands	1,227	12.7
Ireland	304	3.1
Netherlands	254	2.6
Great Britain	198	2.1
Italy	167	1.7
Spain	165	1.7
Luxembourg	79	0.8
Other	213	2.2
<b>Total</b>	<b>9,697</b>	

Source: Cetorelli and Peristiani (2012).

**Table 3: Comparison of Collateral Losses for US CDOs and Offshore CDOs**

Country of issuance	Total Value of Collateral Losses (\$ billions)	Collateral Loss per Tranche Face Value	Percentage of Collateral Loss per Tranche	Average collateral loss per CDO
<b>United states</b>	20.64	2.31	29.36%	\$ 2,292,853,957
<b>Offshore</b>	1248.41	3.38	32.74%	\$ 2,457,504,382
Cayman Islands	1191.78	3.41	34.9%	\$ 2,524,964,524
Ireland	50.61	2.75	21.2%	\$ 1,687,025,813
Jersey	6.02	4.43	3.7%	\$ 1,003,032,727

Source: Open Source Model, Bloomberg L.P.

**Table 4: OLS Regression –**

**Effects of Country of Issuance on Collateral Losses at the Tranche Level**

	CollatLoss1	CollatLoss2	CollatLoss3
	(1)	(2)	(3)
Country: Ireland	-0.06** (0.03)	-0.06* (0.03)	-0.05* (0.03)
Country: Jersey	-0.27*** (0.06)	-0.16** (0.07)	-0.15** (0.07)
Country: United States	0.00 (0.04)	0.12*** (0.04)	0.12*** (0.05)
Number of tranches	0.06*** (0.00)	0.07*** (0.00)	0.07*** (0.00)
Year: 2004	-0.05 (0.29)	-0.09 (0.32)	-0.10 (0.33)
Year: 2005	-0.11 (0.28)	-0.16 (0.32)	-0.17 (0.32)
Year: 2006	0.05 (0.28)	0.07 (0.32)	0.07 (0.32)
Year: 2007	0.08 (0.28)	0.16 (0.32)	0.16 (0.32)
Year: 2008	0.39 (0.32)	0.53 (0.35)	0.53 (0.36)
Average rating score	0.01*** (0.00)	0.00* (0.00)	0.00* (0.00)
Deal Type: ABS/REIT	0.16 (0.11)	-0.08 (0.12)	-0.09 (0.12)
Deal Type: CDO Securities	-0.27*** (0.03)	-0.26*** (0.04)	-0.26*** (0.04)
Deal Type: CDO Securities/ABS	-0.01 (0.03)	0.05 (0.03)	0.05 (0.04)
Deal Type: Investment Grade	-0.22* (0.13)	-0.17 (0.14)	-0.13 (0.14)
Deal Type: Mixed	0.00 (0.04)	-0.04 (0.05)	-0.04 (0.05)

Deal Type: RMBS	-0.03 (0.05)	-0.13** (0.06)	-0.14** (0.06)
Deal Type: Structured Finance	-0.01 (0.02)	0.01 (0.02)	0.01 (0.02)
Deal Type: Structured Finance /REIT	-0.02 (0.06)	-0.08 (0.06)	-0.09 (0.06)
Deal Type: Synthetic ABS	0.31*** (0.03)	0.23*** (0.03)	0.23*** (0.03)
Deal Type: Synthetic ABS/RMBS	0.16** (0.08)	0.13 (0.09)	0.13 (0.09)
Deal Type: Synthetic CDO Securities	-0.21** (0.08)	0.03 (0.09)	0.03 (0.09)
Deal Type: Synthetic Investment Grade	-0.18*** (0.05)	-0.27*** (0.05)	-0.28*** (0.05)
Deal Type: Synthetic Mezzanine	-0.07 (0.12)	0.11 (0.13)	0.10 (0.13)
Deal Type: Synthetic Mixed	0.27*** (0.06)	0.32*** (0.06)	0.32*** (0.06)
Deal Type: Synthetic RMBS	0.52*** (0.08)	0.46*** (0.09)	0.46*** (0.09)
Deal Type: Synthetic RMBS/CDO	-0.15 (0.12)	0.36*** (0.13)	0.44*** (0.13)
Deal Type: Synthetic Structured Finance	0.21*** (0.01)	0.18*** (0.02)	0.18*** (0.02)
Current Face Value	0.16*** (0.02)	0.22*** (0.03)	0.22*** (0.03)
Coupon	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Lead manager: Barclays	0.10** (0.04)	0.17*** (0.05)	0.17*** (0.05)
Lead manager: Bear Stearns	0.05 (0.04)	0.00 (0.04)	-0.00 (0.04)
Lead manager: Calyon Bank	0.18*** (0.04)	0.23*** (0.04)	0.22*** (0.04)
Lead manager: Citi	0.06* (0.03)	0.13*** (0.03)	0.13*** (0.03)

Lead manager: Credit Suisse	0.01 (0.04)	-0.02 (0.04)	-0.02 (0.04)
Lead manager: Deutsche Bank	0.00 (0.03)	-0.03 (0.04)	-0.03 (0.04)
Lead manager: Dresdner Kleinwort	-0.18** (0.07)	-0.11 (0.08)	-0.11 (0.08)
Lead manager: Fortis Bank	0.07 (0.06)	0.11 (0.07)	0.11 (0.07)
Lead manager: Goldman Sachs	-0.10*** (0.03)	-0.06* (0.04)	-0.07* (0.04)
Lead manager: ICP	-0.04 (0.06)	-0.14* (0.07)	-0.15** (0.07)
Lead manager: JP Morgan	-0.17*** (0.04)	0.05 (0.05)	0.05 (0.05)
Lead manager: Lehman Brothers	0.11*** (0.04)	0.08* (0.04)	0.07* (0.04)
Lead manager: Merrill Lynch	0.01 (0.03)	0.05* (0.03)	0.05* (0.03)
Lead manager: Morgan Stanley	0.01 (0.04)	-0.05 (0.04)	-0.05 (0.04)
Lead manager: Others	0.04 (0.04)	0.09* (0.05)	0.09* (0.05)
Lead manager: RBC	0.05 (0.06)	-0.01 (0.07)	-0.01 (0.07)
Lead manager: RBS	0.06 (0.03)	0.00 (0.04)	-0.01 (0.04)
Lead manager: UBS	0.15*** (0.03)	0.12*** (0.03)	0.11*** (0.03)
Lead manager: Wachovia	-0.00 (0.03)	-0.05 (0.04)	-0.05 (0.04)
Lead manager: WestLB	0.09 (0.07)	0.10 (0.07)	0.10 (0.07)
Constant	-0.16 (0.29)	-0.14 (0.32)	-0.13 (0.32)
<i>N</i>	3,083	3,083	3,083
<i>R</i> <sup>2</sup>	0.43	0.44	0.44
Adjusted <i>R</i> <sup>2</sup>	0.42	0.44	0.43

Residual Std. Error (df = 3053)	0.28	0.31	0.31
F Statistic (df = 29; 3053)	46.36***	49.40***	48.80***

*Notes:*

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

Note: The dependent variables are three estimations of the value of collateral losses per tranche. CDO characteristics variables are provided as control variables to isolate the effects of *Country* on collateral losses. Average rating score is an average of numerical scores converted from credit ratings of Fitch, Moody's and Standard & Poor's. *Country* refers to the country of issuance of the CDO, i.e. the country where the SPV is established. *Deal Type* refers to the type of collateral underlying the CDO. Coupon is estimated from the average 1-month, 3-month or 6-month US LIBOR rate for the appropriate year + premium for each tranche. Collateral losses and face values are in billions of dollars. *Country*, *Year* and *Deal Type* are categorical variables.



**Table 5: OLS Regressions –**

**Effects of Country of Issuance on Percentage of Collateral Value Lost at the Tranche Level**

	%CollateralLoss1	%CollateralLoss2	%CollateralLoss3
	(1)	(2)	(3)
Country: Ireland	-3.39 (2.33)	-3.58* (2.12)	-3.52* (2.13)
Country: Jersey	-14.31*** (4.84)	-11.04** (4.39)	-10.60** (4.40)
Country: United States	-12.11*** (3.30)	1.78 (3.00)	2.49 (3.01)
Number of tranches	2.52*** (0.28)	2.20*** (0.25)	2.20*** (0.25)
Year: 2004	8.05 (24.02)	11.05 (21.82)	10.94 (21.87)
Year: 2005	13.14 (23.30)	15.53 (21.17)	15.46 (21.22)
Year: 2006	30.30 (23.31)	38.20* (21.18)	38.25* (21.23)
Year: 2007	36.37 (23.32)	49.00** (21.19)	49.27** (21.24)
Year: 2008	37.54 (26.10)	37.27 (23.71)	37.30 (23.76)
Average rating score	-0.07 (0.16)	-0.42*** (0.14)	-0.43*** (0.14)
Deal Type: ABS/REIT	26.24*** (9.05)	-2.43 (8.23)	-2.89 (8.24)
Deal Type: CDO Securities	-32.34*** (2.63)	-10.88*** (2.39)	-9.23*** (2.39)
Deal Type: CDO Securities/ABS	-9.30*** (2.58)	0.20 (2.35)	0.51 (2.35)
Deal Type: Investment Grade	-10.42 (10.29)	-7.24 (9.35)	-5.71 (9.37)
Deal Type: Mixed	11.10*** (3.35)	12.27*** (3.05)	12.04*** (3.05)

Deal Type: RMBS	3.40 (4.07)	-4.71 (3.70)	-5.20 (3.70)
Deal Type: Structured Finance	-2.86* (1.63)	-1.18 (1.48)	-1.16 (1.48)
Deal Type: Structured Finance /REIT	-6.94 (4.65)	-9.70** (4.23)	-10.25** (4.24)
Deal Type: Synthetic ABS	20.73*** (2.13)	14.33*** (1.93)	13.87*** (1.94)
Deal Type: Synthetic ABS/RMBS	19.70*** (6.52)	13.44** (5.92)	13.20** (5.94)
Deal Type: Synthetic CDO Securities	-39.86*** (6.81)	18.39*** (6.19)	18.79*** (6.21)
Deal Type: Synthetic Investment Grade	-20.63*** (3.72)	-29.79*** (3.38)	-30.17*** (3.39)
Deal Type: Synthetic Mezzanine	-5.25 (9.71)	21.12** (8.83)	20.84** (8.85)
Deal Type: Synthetic Mixed	15.13*** (4.56)	13.53*** (4.15)	13.43*** (4.15)
Deal Type: Synthetic RMBS	30.14*** (6.56)	25.38*** (5.96)	25.05*** (5.98)
Deal Type: Synthetic RMBS/CDO	-38.15*** (9.83)	-4.55 (8.93)	1.01 (8.95)
Deal Type: Synthetic Structured Finance	15.85*** (1.14)	20.66*** (1.04)	20.38*** (1.04)
Current Face Value	-2.85 (1.86)	-3.97** (1.69)	-3.94** (1.69)
Coupon	0.42* (0.23)	0.72*** (0.21)	0.73*** (0.21)
Lead manager: Barclays	-10.48*** (3.42)	-8.73*** (3.11)	-8.91*** (3.12)
Lead manager: Bear Stearns	7.57** (2.95)	1.27 (2.68)	0.96 (2.69)
Lead manager: Calyon Bank	-5.94* (3.09)	-6.22** (2.80)	-6.45** (2.81)
Lead manager: Citi	-5.43**	-3.46	-3.05

	(2.50)	(2.27)	(2.28)
Lead manager: Credit Suisse	-1.71 (2.92)	-0.64 (2.65)	-0.93 (2.66)
Lead manager: Deutsche Bank	2.62 (2.74)	0.03 (2.49)	-0.24 (2.50)
Lead manager: Dresdner Kleinwort	-22.14 <sup>***</sup> (6.10)	-15.17 <sup>***</sup> (5.54)	-14.91 <sup>***</sup> (5.56)
Lead manager: Fortis Bank	-4.00 (5.32)	-2.52 (4.84)	-2.90 (4.85)
Lead manager: Goldman Sachs	-19.99 <sup>***</sup> (2.65)	-16.74 <sup>***</sup> (2.41)	-16.87 <sup>***</sup> (2.41)
Lead manager: ICP	-13.94 <sup>***</sup> (5.14)	-21.21 <sup>***</sup> (4.67)	-21.77 <sup>***</sup> (4.68)
Lead manager: JP Morgan	-25.86 <sup>***</sup> (3.36)	0.90 (3.05)	0.95 (3.05)
Lead manager: Lehman Brothers	-5.29 <sup>*</sup> (3.04)	-9.96 <sup>***</sup> (2.77)	-10.27 <sup>***</sup> (2.77)
Lead manager: Merrill Lynch	-5.06 <sup>**</sup> (2.37)	1.49 (2.16)	1.85 (2.16)
Lead manager: Morgan Stanley	5.38 <sup>*</sup> (3.25)	-1.93 (2.95)	-2.22 (2.96)
Lead manager: Others	-7.73 <sup>**</sup> (3.61)	8.56 <sup>***</sup> (3.28)	8.14 <sup>**</sup> (3.28)
Lead manager: RBC	11.35 <sup>**</sup> (5.25)	6.52 (4.77)	6.43 (4.78)
Lead manager: RBS	6.44 <sup>**</sup> (2.87)	0.99 (2.61)	0.56 (2.62)
Lead manager: UBS	0.50 (2.49)	-4.48 <sup>**</sup> (2.26)	-4.87 <sup>**</sup> (2.27)
Lead manager: Wachovia	-15.06 <sup>***</sup> (2.88)	-19.31 <sup>***</sup> (2.61)	-19.60 <sup>***</sup> (2.62)
Lead manager: WestLB	0.70 (5.38)	2.31 (4.88)	2.14 (4.89)
Constant	-11.89 (23.49)	-9.71 (21.34)	-9.18 (21.39)

<i>N</i>	3,079	3,079	3,079
<i>R</i> <sup>2</sup>	0.45	0.55	0.55
Adjusted <i>R</i> <sup>2</sup>	0.44	0.54	0.54
Residual Std. Error (df = 3029)	22.75	20.67	20.71
F Statistic (df = 49; 3029)	49.60 <sup>***</sup>	74.86 <sup>***</sup>	74.50 <sup>***</sup>

*Notes:*

<sup>\*\*\*</sup> Significant at the 1 percent level.

<sup>\*\*</sup> Significant at the 5 percent level.

<sup>\*</sup> Significant at the 10 percent level.

Note: The dependent variables are three estimations of the percentage of collateral value defaulted. CDO characteristics variables are provided as control variables to isolate the effects of *Country* on collateral losses. Average rating score is an average of numerical scores converted from credit ratings of Fitch, Moody's and Standard & Poor's. *Country* refers to the country of issuance of the CDO, i.e. the country where the SPV is established. *Deal Type* refers to the type of collateral underlying the CDO. Coupon is estimated from the average 1-month, 3-month or 6-month US LIBOR rate for the appropriate year + premium for each tranche. *Country*, *Year* and *Deal Type* are categorical variables.

**Table 6: OLS regressions –**

**Effects of Credit Ratings and Tier 1 Capital Ratio on Country-Specific CDO Performance**

**(Collateral Loss in \$ billions)**

	Collateral Loss (1)	Collateral Loss (2)	Collateral Loss (3)	Collateral Loss (4)
Country	Cayman Islands	Jersey	Ireland	US
Average rating score	0.01*** (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)
Tier 1 capital ratio	-0.02 (0.14)	-2.57*** (0.00)	-0.01 (0.01)	-0.23*** (0.00)
Number of tranches	0.06*** (0.00)	-0.04*** (0.00)	0.07*** (0.02)	-0.01*** (0.00)
Year: 2005	-0.06 (0.09)			
Year: 2006	0.12 (0.09)		0.14*** (0.04)	
Year: 2007	0.13 (0.09)		0.26*** (0.05)	0.07*** (0.00)
Deal Type: ABS/REIT	0.26** (0.11)			
Deal Type: CDO Securities	-0.29*** (0.04)			-0.29*** (0.00)
Deal Type: CDO Securities/ABS	0.04 (0.03)			-0.22*** (0.00)
Deal Type: INVESTMENT GRADE			-0.58*** (0.12)	
Deal Type: Mixed	0.09* (0.05)			
Deal Type: RMBS	-0.03			

	(0.05)			
Deal Type: Structured Finance	0.00		-0.11 <sup>***</sup>	
	(0.02)		(0.04)	
Deal Type: Structured finance/REIT	-0.07		0.02	
	(0.07)		(0.07)	
Deal Type: Synthetic ABS	0.30 <sup>***</sup>			-0.22 <sup>***</sup>
	(0.03)			(0.00)
Deal Type: Synthetic ABS/RMBS	0.14 <sup>*</sup>			
	(0.08)			
Deal Type: Synthetic CDO Securities	-0.21 <sup>**</sup>			
	(0.08)			
Deal Type: Synthetic Investment Grade	0.03		-0.31 <sup>***</sup>	
	(0.06)		(0.10)	
Deal Type: Synthetic Mezz	-0.03			
	(0.12)			
Deal Type: Synthetic Mixed	0.30 <sup>***</sup>			
	(0.06)			
Deal Type: Synthetic RMBS	0.54 <sup>***</sup>	-0.21 <sup>***</sup>		
	(0.09)	(0.00)		
Deal Type: Synthetic Structured Finance	0.21 <sup>***</sup>		0.07	
	(0.02)		(0.04)	
Current Tranche Face Value	0.18 <sup>***</sup>	0.00	0.05	-0.00 <sup>***</sup>
	(0.03)	(0.00)	(0.05)	(0.00)
Coupon	0.00	0.00	-0.01	-0.00
	(0.00)	(0.00)	(0.01)	(0.00)
Constant	-0.22	20.24 <sup>***</sup>	-0.27	2.93 <sup>***</sup>

	(1.13)	(0.00)	(0.17)	(0.00)
<i>N</i>	2,521	19	118	52
<i>R</i> <sup>2</sup>	0.43	1.00	0.75	1.00
Adjusted <i>R</i> <sup>2</sup>	0.42	1.00	0.72	1.00
Residual Std. Error	0.28 (df = 2483)	0.00 (df = 12)	0.12 (df = 104)	0.00 (df = 42)
F Statistic	49.67*** (df = 37; 2483)	102,509,480,450, 763,399,120,208, 828.00*** (df = 6; 12)	24.00*** (df = 13; 104)	4,258,838,519,530, ,944,820,464,882, 822,202.00*** (df = 9; 42)

Notes:

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

Note: The dependent variable is the value of collateral losses per tranche. Regression (1) also includes *Lead Manager* as an independent variable. CDO characteristics variables are provided as control variables to isolate the effects of *Average rating score* and *Tier 1 capital ratio* on collateral losses. Tier 1 capital ratio is an average of CDO sponsor banks' capital ratios for the 2000-2003 period when data was available. Average rating score is an average of numerical scores converted from credit ratings of Fitch, Moody's and Standard & Poor's. *Deal Type* refers to the type of collateral underlying the CDO. Coupon is estimated from the average 1-month, 3-month or 6-month US LIBOR rate for the appropriate year + premium for each tranche. *Year* and *Deal Type* are categorical variables.

**Table 7: OLS regressions –**

**Effects of Credit Ratings and Tier 1 Capital Ratio on Country-Specific CDO Performance  
(Percentage of Collateral Loss per Tranche)**

	% Collateral Loss (1) Cayman Islands	% Collateral Loss (2) Jersey	% Collateral Loss (3) Ireland	% Collateral Loss (4) US
Average rating score	0.00 (0.17)	0.00 (0.00)	0.33 (0.53)	-0.00 (0.00)
Tier 1 capital ratio	54.87*** (11.57)	-410.60*** (0.00)	-8.20*** (1.46)	-5.42*** (0.00)
Number of tranches	2.44*** (0.30)	-13.54*** (0.00)	0.80 (2.00)	3.38*** (0.00)
Year: 2005	3.90 (7.02)			
Year: 2006	21.93*** (7.02)		10.37* (5.51)	
Year: 2007	26.28*** (7.07)		28.46*** (6.95)	0.94*** (0.00)
Deal Type: ABS/REIT	33.33*** (9.05)			
Deal Type: CDO Securities	-31.63*** (3.17)			-27.06*** (0.00)
Deal Type: CDO Securities/ABS	-5.32* (2.79)			-22.74*** (0.00)
Deal Type: Mixed	23.30*** (3.64)			
Deal Type: RMBS	3.51 (4.03)			
Deal Type: Structured Finance	-2.08 (1.82)		-11.86** (4.75)	



Deal Type: Structured Finance/REIT	-13.78 <sup>***</sup> (5.23)	35.28 <sup>***</sup> (8.65)	
Deal Type: Investment Grade		-23.68 (14.95)	
Deal Type: Synthetic ABS	20.89 <sup>***</sup> (2.44)		48.49 <sup>***</sup> (0.00)
Deal Type: Synthetic ABS/RMBS	16.30 <sup>**</sup> (6.48)		
Deal Type: Synthetic CDO Securities	-39.37 <sup>***</sup> (6.76)		
Deal Type: Synthetic Investment Grade	-5.53 (4.98)	-4.88 (13.06)	
Deal Type: Synthetic Mezz	0.72 (9.68)		
Deal Type: Synthetic Mixed	17.52 <sup>***</sup> (4.53)		
Deal Type: Synthetic RMBS	34.10 <sup>***</sup> (7.30)	-44.45 <sup>***</sup> (0.00)	
Deal Type: Synthetic Structured Finance	15.78 <sup>***</sup> (1.24)	47.57 <sup>***</sup> (5.49)	
Deal Type: Synthetic RMBS/CDO		-16.32 <sup>*</sup> (8.70)	

Current Tranche Face Value	-2.38 (2.12)	0.00 (0.00)	1.15 (5.99)	-0.00*** (0.00)
Coupon	0.42 (0.26)	0.00 (0.00)	-0.71 (0.89)	-0.00 (0.00)
Constant	-442.95*** (90.46)	3,261.49*** (0.00)	68.37*** (21.82)	54.38*** (0.00)
<i>N</i>	2,521	19	118	52
<i>R</i> <sup>2</sup>	0.45	1.00	0.75	1.00
Adjusted <i>R</i> <sup>2</sup>	0.44	1.00	0.72	1.00
Residual Std. Error	22.48 (df = 2483)	0.00 (df = 12)	14.95 (df = 104)	0.00 (df = 42)
F Statistic	54.05*** (df = 37; 2483)	57,217,902,157,57 7,984,912,062,488 .00*** (df = 6; 12)	23.81*** (df = 13; 104)	3,275,371,745,218, 738,641,604,286,0 08,422.00*** (df = 9; 42)

*Notes:*

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

Note: The dependent variable is the percentage of collateral value defaulted. Regression (1) also includes *Lead Manager* as an independent variable. CDO characteristics variables are provided as control variables to isolate the effects of *Average rating score* and *Tier 1 capital ratio* on collateral losses. Tier 1 capital ratio is an average of CDO sponsor banks' capital ratios for the 2000-2003 period when data was available. Average rating score is an average of numerical scores converted from credit ratings of Fitch, Moody's and Standard & Poor's. *Deal Type* refers to the type of collateral underlying the CDO. Coupon is estimated from the average 1-month, 3-month or 6-month US LIBOR rate for the appropriate year + premium for each tranche. *Year* and *Deal Type* are categorical variables.

**Table 8: Wald Tests for the Overall Effect of the Country Variable on CDO Performance**

Regression	$\chi^2$	Degrees of Freedom	P(> $\chi^2$ )
CollatLoss1	26.5	3	7.5e-06
CollatLoss2	9.6	3	0.023
CollatLoss3	8.6	3	0.035
%CollateralLoss1	11.1	3	0.011
%CollateralLoss2	9.4	3	0.024
%CollateralLoss3	8.7	3	0.033

Note: Regression refers to the appropriate regression for which the Wald Test was calculated. The regressions in question are in Tables 4 and 5.