Systemic Risk and Firm Size: Is Notional Amount a Good Metric?

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Systemic Risk and Firm Size: Is Notional Amount a Good Metric?

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Abstract

Many recently-enacted financial regulations exempt smaller entities, where the definition of "small" is based on the size of their positions or their trading volumes. These exemptions can be defended on efficiency grounds: smaller firms face relatively high fixed costs of complying with regulations, but contribute relatively little to systemic risk. This policy tradeoff, however, implicitly requires that size be measured appropriately. Along these lines, this note argues that notional amount, the metric used to measure size in regulations of derivatives markets does not appropriately measure an entity's contribution to systemic risk. We propose that ENNs, an alternative, risk-based metric of size, better corresponds to the concept of systemic risk. We empirically show that notional amount is only weakly correlated with ENNs in the interest rate swap (IRS) market for the set of the entities that are currently exempt from the uncleared margin rule, but will be required to come into compliance in the near future.

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I. Introduction

The Dodd-Frank Act, passed in the wake of the 2008 financial crisis, encompassed a set of new regulations intended to enhance the resilience of the financial sector. In particular, an explicit goal of many of these regulations was to reduce the likelihood that many market participants are simultaneously affected by severe losses, or what is often referred to as systemic risk. A consistent feature of these regulations, across many jurisdictions, is treating "small" market participants differently from larger ones. For example, under post-crisis capital rules, all banks became subject to more stringent leverage requirements,[2] but the required ratio differs across banks: a ratio of 7.5% of tier 1 capital to total exposure (plus an additional buffer) is required for the largest banks, while a ratio of 4% is required for smaller banks. Another example is the Volcker Rule, which bans proprietary trading by commercial banks and their affiliates (see Allahrakha, *et al*., 2019 for details), but exempts banks with assets less than $10 billion and trading assets less than 5% of total assets.[3]

Similar distinctions exist in derivatives regulation. Banks with less than $10 billion in assets may claim an exemption from the requirement to clear certain swaps. Swap dealers with annual trading activity of less than $8 billion notional value are exempt from registration requirements. And entities with uncleared swap positions below $8 billion notional amount are exempt from the requirement to post margin under the uncleared margin rule (UMR).[4]

The principal argument for exempting small market participants from certain requirements is that compliance costs do not justify the accompanying reductions in systemic risk. The costs of complying with regulations often have a large fixed component, which means that compliance costs will tend to be particularly burdensome for smaller entities. In addition to the harm they bear individually, the weakened position or even closure of many small entities could lead to increased market concentration and adverse effects, e.g., higher bid-ask spreads on swaps. And in regard to systemic risk, the literature suggest that an entity's contribution to systemic risk increases more than proportionately with its size,

[2] In this context, leverage refers to the ratio of tier 1 capital to "total exposure." This regulation is the U.S. implementation of the Basel III Banking Accord. See Batista and Karmakar, 2017 for analysis of the intent of this regulation, and Gambacorta and Karmakar, 2018 for a discussion of the relationship to systemic risk concerns.

[3] See, Revisions to Prohibitions and Restrictions on Proprietary Trading and Certain Interests In, and Relationships With, Hedge Funds and Private Equity Funds, 84, FR 140. For entities with more than $10 billion in assets, but less than $250 billion, there is a sliding scale of restrictions that depend on asset size.

[4] 17 CFR Parts 23 and 140 Margin Requirements for Uncleared Swaps for Swap Dealers and Major Swap Participants; Final Rule (Jan. 2, 2016), 81 FR 635. Similar requirements went into effect at the same time in other jurisdictions. See ISDA (2018).

so that smaller entities tend to be of lesser concern (Tarashev, Borio and Tsatsaronis, 2010).[5] Hence, the logic of these exemptions is that the costs of imposing various requirements on smaller entities are often not justified by the social benefit of doing so.

While the reason for exempting small market participants is clear, implementation is less so. In the case of derivatives, following Haynes *et al.* (2018), we argue that the regulatory metric of size – notional amount – is a flawed measure of the risk an entity poses to the financial system for two reasons. First, it fails to adjust for significant risk characteristics, like maturity and optionality. Second, it sums long and short positions between a pair of counterparties, whereas it is their net positions that are relevant for assessments.

We argue further that the amount of risk transferred through an entity's positions is the appropriate way to measure its size for the purpose of evaluating its contribution to systemic risk. We then demonstrate the empirical relevance of this issue in the context of the interest rate swaps (IRS) market by showing that the notional positions of entities likely to be brought into scope under the uncleared margin rule (UMR) are only weakly correlated with the amount of risk transfer in their IRS positions.[6] Hence, a threshold based on notional amount is not an effective way to distinguish entities by their contribution to systemic risk.

II. Systemic Risk and Post-Crisis Regulation

The UMR was part of a wide range of regulatory responses to the 2007/8 financial crisis. Many of these new policies were explicitly linked to the premise that systemic risk issues led to the crisis. As policy-makers became more focused on systemic risk after the crisis, an academic literature developed as well. Generally, systemic risk relates to the correlation of downside risk to industry participants. Acharya *et al*. (2017) provide a more specific definition which allows them to model optimal policy; a systemic event is when financial sector capital is below some critical value. Hence, systemic risk is the likelihood that many market participants are simultaneously affected by severe losses, which results in a

[5] As Adrian and Brunnermeier (2016) show, this conclusion depends on the correlation of positions of small market participants. If all small entities had very similar positions, then their aggregate size would be relevant to analyzing their contribution to systemic risk. Adrian and Brunnermeier's estimation provides a basis for the differential leverage ratios applied to banks of different sizes. In regard to derivatives, as we show below, the entities that will be newly subject to the uncleared margin rule in the next 30 months appear to be heterogeneous in regard to the directions of their positions, and in their ratio of notional to risk transfer.

[6] Note that requirements under the uncleared margin rule relate to uncleared positions aggregated across swaps categories, while the calculation here is based solely on IRS position. As noted below, IRS accounts for more than half of uncleared OTC derivative positions, so that IRS position is indicative of total swap position for many entities. In addition, our analysis is intended to illustrate the magnitude of the difference between risk transfer and notional amount for entities likely to become in-scope during the next two phases of the UMR.

systemic event. The premise of this literature is that there are aspects of financial markets which tend to result in firms having a correlated likelihood of large losses, and that there are externalities to the broader economy resulting from those correlated losses.

In regard to why large losses are correlated, the literature has identified three broad classes of effects, which Benoit *et al*. (2017) refer to as systemic risk taking, contagion and amplification. Systemic risk taking refers to reasons that financial entities might have portfolios with similar risk exposure to one another. For example, Perotti, Ratnovski and Vlahn (2011) show that traditional capital requirements encourage all banks to acquire assets which tend to substitute tail risk for normal risks. Contagion refers to the consequences of banks (rationally) being creditors of one another, so that large losses by one bank lead to losses by others. Finally, amplification might occur, when for example, a price shock leads to asset liquidation in order to pay margins, which in turn amplifies the price effect – or what are sometimes called "fires sales" (see, e.g., Allen and Gale, 1994).

Some of these aspects of financial markets also explain why externalities can result from these correlated losses. For example, the essence of contagion is that the failure of an entity may in turn reduce the viability of its unsecured creditors. A related consequence of contagion is that many banks will be reducing their asset portfolios simultaneously, leading to reduced intermediation, which can result in large effects in the real economy (Adrian and Brunnermeier, 2016). Another such externality might occur with fire sales, as these events move prices further away from fundamental values, reducing the information value of prices. Because of the potential for externalities, there is a clear role for regulation to prevent and ameliorate systemic events.

The policies that have been enacted to attempt to reduce systemic risk in the banking sector have tended to focus on ensuring that banks remain viable in the face of large, but plausible, losses. For example, Basel III introduced a requirement that the largest banks maintain a ratio of 7.5% of tier 1 capital to total exposure (plus an additional buffer). These policies generally focus on insuring that banks are adequately capitalized, which is intended to encourage banks to take less risk. This differs somewhat from policy prescriptions from the literature, which have tended to encourage more focused policies that discourage risks that are likely to occur in systemic events, such as banks holding similar portfolios (see, e.g., Acharya *et al*., 2016). In fact, Wagner (2010) suggests that policies focused on overall risk-taking may encourage more homogenous asset portfolios across banks.

In regard to banks' portfolios, another Dodd-Frank regulation, the Volcker rule, prohibited commercial banks and their affiliates from taking directional positions in securities trading (albeit with some exceptions). The rule reflected former Fed-Chairman Volcker's belief that such speculative activity

played a role in the financial crisis. Empirical evidence (Bao, O'Hara and Zhou, 2018, Bessenbinder *et al*., 2018) suggests that the rule has reduced bank-affiliated dealers' willingness to hold corporate bond positions, although Adrian *et al*. (2017) suggest that factors other than the Volcker rule may explain some of the decline in dealers' positions.

As noted above, another aspect of the actual policies directed towards preventing systemic events is that large firms have more restrictive requirements (e.g., higher required capital) than smaller ones. This is consistent with some results from the theoretical literature. For example, Tarashev, Borio and Tsatsaronis (2010), show that the contribution of a firm to systemic risk increases more than proportionately with its size (assuming returns to smaller firms' assets are not perfectly correlated), suggesting that restrictions like capital requirements should be applied more rigorously to larger firms. Similarly, the results in Adrian and Brunnermeier (2016) suggest that higher leverage ratios are appropriate for larger firms. The question of the appropriate measure of size is essential to such policies, and as shown below, the current metrics do not correspond to the risk-based metrics implied by these models.

Margins are another means to prevent systemic events. In derivatives markets, margins are a form of collateral that investors deposit (usually with a third party depository) when they take positions in those markets. As least as far back as Telser (1981), it has been recognized that margins reduce the risk faced by derivatives traders in at least two ways. First, they provide funds that a defaulting firm's counterparty can obtain in the event of default, lowering the counterparty's loss from the default. Second, margins serve to reduce the size of positions, since higher margins reduce the return to taking a derivatives position.[7] A number of empirical studies have demonstrated this latter relationship (see, e.g., Hardouvilis and Kim, 1995, Fishe *et al.*, 1990, Chou, Wang and Wang, 2015).[8]

Because margins can reduce risky positions, regulations concerning margins were part of the new regulatory regime that came into effect after the 2007/8 financial crises. In the US, an explicit goal of the Dodd-Frank Act was to insure that traders would not be able to take large unmargined positions.[9] More

[7] Biais, Heider and Hoerova (2016) suggest another mechanism by which margins can reduce defaults in CDS markets. In their model, higher margins reduce moral hazard by CDS sellers.

[8] Of course, by making derivatives trading more expensive, higher margins can also reduce firms' ability to hedge, as emphasized by Gibson and Murawsky (2015), or other negative effects (see, e.g., Brunnermeier and Pedersen, 2009 - where the pro-cyclicality of margins leads to "price spirals")

[9] "Our legislation brings tough new restrictions for the first time to the opaque, unregulated [OTC derivatives] market. . . . Dealers and large market participants will . . . and never again be able to amass a large, unsecured position in swaps that can threaten the stability of the financial system." Representative Dodd, quoted in Charles Abbott and Kevin Drawbaugh, "U.S. Seeks Crackdown on Loosely Regulated Derivatives," *Reuters*, May 14, 2009, http:// www.reuters.com/article/2009/05/14/us-financial-derivatives-idUSTRE54C76J20090514.

generally, like the regulations aimed at reducing systemic risk in the banking sector, many of new regulation of derivatives markets were aimed at reducing systemic risk.[10] One such regulation was mandating central clearing for certain instruments (such as the on-the-run index CDS contract).[11] This requirement led to margins for all such instruments, since margins are always required for cleared trades. For other instruments, the UMR mandated margins on the uncleared swaps of the largest traders (*covered entities*), as well as establishing a floor on margin requirements for covered entities trading any swap that is not centrally cleared.

III. Entity Size

The literature on systemic risk has identified a variety of reasons that the failure of large entities can generate important negative externalities, and hence can provide a motivation for the post-crisis regulatory changes. As noted above, one aspect of these regulations is that entities are treated differently, depending on their size. For the UMR, the measure of size used by regulators to determine exemptions is the notional position of the entity. The notional amount of a single IRS is the amount used to compute interest payments due on that swap. For example, an IRS with a notional amount of $100 million and a fixed rate of 3% requires fixed payments of $3 million per year. The contention of this paper is that notional amount is not a reliable measure of the extent to which an entity's default would affect markets. More specifically, the externalities of default highlighted in the literature - rapid price changes, the loss of intermediation services, and the failure of counterparties- are most closely related to the amount of interest rate risk transfer between counterparties.[12] But notional amount is a poor measure of this risk transfer, which we discuss in the context of IRS, although the same issues arise for all types of swaps.

First, individual swaps with the same notional amount can carry very different amounts of interest rate risk. A 3-month IRS, for example, has relatively little interest rate risk, while a 30-year IRS with the same notional size has significantly more exposure. Therefore, the notional amount of a portfolio of swaps of different maturities, which is defined as the sum of the notional amounts of the

[10] For an explicit statement along these lines, see, for example, CFTC Chairman Gary Gensler, "Clearinghouses Are the Answer: Complex Derivatives Should be Regulated Like Commodity Futures," *Wall Street Journal*, April 21, 2010, http://online. wsj.com/article/SB10001424052748704671904575194463642611160.html.

[11] Whether mandatory clearing reduces systemic risk has been topic of considerable interest. See, e.g., Duffie and Zhu (2011), and Cont and Kokholm (2014) for analysis of the relationship between clearing and stability.

[12] Metrics of counterparty risk exposure measure the importance of the third of these externalities, but not the first two. Furthermore, while clearing and the uncleared margin rule have reduced counterparty risk dramatically, the externalities of large, forced liquidations and the loss of intermediation services remain.

individual swaps, is difficult to interpret with respect to underlying risk transfer. To take a simple example, an entity with a large portfolio of short-tenor swaps could have a larger notional amount, but less risk transfer, than an entity with a small notional amount of long-tenor swaps. Similar problems arise for swaps with embedded optionality, which can have very different risks for a given notional amount, relative to other swaps.

Because systemic risk is related to the likelihood of large asset value changes (tail risk), a more appropriate measure of size is obtained by scaling each position held by an entity by the responsiveness of the position's value to changes in interest rates. A commonly-used metric for relating the two is DV01, which is a linear approximation of the responsiveness of asset prices to interest rate changes (see Tuckman and Serrat, 2012).

A second issue with notional, which often arises in OTC markets like IRS (for reasons described below), is that trading often leaves pairs of counterparties with long and short positions against each other that are largely risk offsetting.[13] Because notional amount simply adds together these risk-offsetting longs and shorts, it can significantly overstate risk transfer between pairs of counterparties.

An approach to adjusting notional amounts to reflect these issues was recently developed by Haynes *et al.* (2018). Their measure, entity-netted notionals, or ENNs, adjusts for interest rate risk and then nets this adjusted amount within each pair of traders. In the case of IRS, all swap positions are made comparable by converting notional amounts to 5-year swap equivalents using DV01. This means that the responsiveness to interest rate changes of the values of two swaps with the same 5-year equivalent amounts will be approximately the same (regardless of the notional amounts that generated them), a property which does not generally hold for swaps with a common notional amount.

Having converting notional amounts into 5-year equivalents, summing the resulting values within each counterparty pair in each currency preserves the interest-rate sensitivity of the individual swaps, and yields a single, readily-interpreted number. Hence, within each pair, one entity is long, and the other short, net 5-year equivalents. Finally, an entity's aggregate long and short ENNs positions are calculated by summing its ENNs with each of its counterparties. Note that, in calculating ENNs, one does not net long and short ENNs for an entity across its counterparties. Each entity can have long ENNs against some counterparties and short ENNs against others, and, therefore, have both long and short aggregate ENNs.

[13] A "long" position in an IRS has the same directional exposure as a long bond position; that is, profiting from a decline in rates and losing from a rise in rates. Similarly, a "short" position in an IRS has the same directional exposure as a short bond position. Note that using "long" and "short" in this way is not uniformly standard in the academic literature.

We focus on IRS, which represents the bulk of the OTC derivative market. According to BIS, IRS represented about 80% of worldwide OTC derivative positions in 2019, and about 53% of uncleared OTC derivative positions (BIS, 2019). In addition, features of this market lead to a sharp distinction between raw notional amounts and ENNs. To understand this point, recall that, in futures markets, an entity with a long position typically gets to zero exposure by taking a perfectly offsetting short position in a new trade. In IRS markets, by contrast, entities will typically offset the risk of positions by entering into new positions on the opposite side, possibly with slightly different swaps and possibly with different counterparties, so that they simultaneously hold long and short positions. The reason for this practice is that trading costs are usually minimized by trading one of the more liquid contracts rather than trading out of an existing contract.[14] As a result, an entity may be flat total interest rate risk (although bearing some counterparty risk), but have a large notional position on both the long and short sides.

Netting has a substantial effect both on the calculation of the size of aggregate risk transfer in the IRS market and, as shown below, on which entities are engaged in the most risk transfer. In regard to the former, the notional amount of IRS positions of all U.S. reporting entities is about $242 trillion. This amount is an order of magnitude larger than the US residential mortgage market (about $11.2 trillion), the US Treasury market ($16.6 trillion), and the US corporate bond market ($14 trillion).[15] However, aggregate ENNs in this market is only about $15 trillion, which is comparable in size to these other debt markets and which seems consistent with the use of IRS as hedging instruments. In any case, in total, ENNs are about 6% of notional IRS. Converting to 5-year equivalents reduces market notional amount by about 40%,[16] and netting accounts for the rest of reduction.

While the evidence presented here pertains only to IRS, ENNs have also been calculated for foreign exchange and credit default swaps,[17] so that our approach can be applied more broadly.

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[14] The most liquid IRS have terms equal to one of the most commonly traded terms to maturity (e.g., 5 or 10 years). Using the example from Haynes *et al.* (2018), suppose a pension fund, when initiating its position, received fixed at 3% in a 10-year swap. Six months later, the pension fund might decide to reduce its risk in its now 9.5-year swap. The 10-year market rate might have moved to 2.75%, and 9.5-year swaps are not nearly as liquid as 10-year swaps. Therefore, instead of unwinding its 3%, 9.5-year swap, the pension fund is likely to pay fixed on a new 2.75%, 10-year swap. The notional amount of the latter would be chosen to match the fund's updated risk target. In any case, these long and short swap positions, the older 3% swap and the newer 2.75% swap, might well both remain on the books of the pension fund for years.

[15] Financial Accounts of the United States, Board of Governors of the Federal Reserve System, Fourth Quarter 2019. https://www.federalreserve.gov/apps/fof/FOFTables.aspxc.

[16] One reason for our finding that positions measured in 5-year equivalents are smaller than notional is that there is a large notional amount of very short-tenor swaps in this market.

[17] See Baker *et al.* (2019).

IV. Uncleared Margin Rule and IRS

To see how a rule based on notional size differs from one based on risk transfer, we examine regulatory data on IRS positions of US entities. As noted, the uncleared margin rule exempts "small" entities from its requirement to post margin on uncleared swaps. The regulation in the United States, as in other jurisdictions, features a schedule under which successively smaller entities became subject to the requirement over time. However, entities below a "material swaps exposure" threshold of uncleared swaps, in terms of notional amount, are permanently exempt. Initially this threshold was set at $3 billion, but was then increased to $8 billion. All entities with notional positions above $8 billion were scheduled to become subject to the rule by September, 2020, but this deadline was subsequently extended.

The data used in this paper are uncleared IRS swap positions on a single date in September, 2019. All U.S.-reporting entities are required, under Part 45 of the Commodity Exchange Act, to report these positions by legal entity identifiers (LEIs), to swap data repositories (SDRs), which, in turn, make the data available to the US Commodity Futures Trading Commission (CFTC).[18] Among other fields, the data list the notional amount, tenor and currency of the swap, whether the swap is cleared, and the LEIs of the two traders. This data allow us to calculate uncleared notional position and ENNs for each entity.

In addition to the SDR data, we use public data to identify and exclude entities that are exempt from the uncleared margin rule, such as U.S.-government entities, foreign central banks, and certain international institutions, such as multilateral development banks. In addition, swaps of commercial end users that are used to hedge commercial risk, and swaps without a swap dealer on either side are also exempt from the rule, and we exclude swaps that claim either of these exemptions from our analysis.

Using affiliate structure data from S&P's Cross Reference Services and other public data sources, we link LEI-level entities to their parent entities. Specifically, we calculate ENNs at the LEI-entity level and then sum these LEI-level ENNs to calculate aggregate long and short ENNs at the parent, or group, level. The group level is the appropriate level of aggregation for our analysis in that the material swap exposure in the uncleared margin rule is determined at the group level. In addition, the group level is appropriate because a default by one entity within a group will likely have implications for the remaining entities within the group and, furthermore, without aggregation to the group level, groups could avoid being subject to the rule by spreading positions across legal entities.

Table 1 shows some aspects of the distribution of the size of entities, after the exclusions mentioned above, aggregated to the group level. In our data, there are 52 entities with uncleared

[18] See Haynes *et al.* (2018) for further details on this data.

notional IRS positions in excess of $100 billion, and they represent about 82 percent of all uncleared positions. The vast majorities of entities will not be in scope even when the rule is fully in effect; only 282 of the 51,382 entities have uncleared notional greater than $8 billion.[19]

The bottom row in Table 1 shows the aggregate total ENNs (long plus short ENNs) for the entities in each of the notional position categories. One thing that is apparent from this table is that ENNs represent a larger percentage of notional for small entities than large ones. This reflects a property of these markets discussed earlier; netting of pairwise positions is common in this market, and is much more likely to occur for frequent traders.

TABLE 1 ABOUT HERE

Table 1 shows the aggregate total ENNs for traders, categorized by notional size. As noted, an entity's total ENNs adds it's summed short ENNs and long ENNs together. This measure overstates its exposure to interest rate risk, if one abstracts from counterparty risk, since its long and short positions will generally move in opposite directions with market changes. However, counterparty risk may be an important aspect of systemic risk, and hence, an entity's total ENNs may be the appropriate measure of risk transfer, depending on the kind of systemic risk externality of concern. Specifically, if one is concerned about contagion, then the default of an entity with (e.g.) long ENNs of 100 and short ENNs of 50 can harm its counterparties as much as the default of a firm with an exclusively long or exclusively short position of 150.[20] In contrast, if "fire sales" are a primary concern, then total ENNs may be a conservative measure of exposure, in that it implicitly assumes that the default of an entity with both long and short ENNs positions is as disruptive to the market as the default of an entity with an exclusively long or exclusively short position of the same magnitude.[21] Hence, total ENNs is likely too pessimistic about the disruption caused by this default because, at least to some extent, the entity's counterparties on the long side will be able to find willing trading partners with the entity's counterparties on the short side, mitigating the net effect on prices. In that case, net ENNs, the absolute difference between long and short ENNs, may be a better (if somewhat optimistic) measure of exposure, as it implicitly assumes that counterparties long and short to the defaulting entity can easily find each other to replace the economics of the positions previously held with the defaulting entity.

[19] Note that, for ease of exposition, the text continues to use the term "entity" to refer both to individual entities and to collections of entities aggregated to the group level

[20] It may be true that a firm with both long and short positions is less likely to default, but we abstract from that issue for this discussion.

[21] For a theoretical discussion of difference between total and net positions see D'Errico and Roukny (2017).

IV. Quantifying ENNs vs. Notional in the IRS Market

As our earlier discussion emphasizes, the goal of the uncleared margin rule was to prevent systemic shocks by imposing additional requirements on entities most likely to cause such shocks. At the time of this writing, the rule applies to entities with more than $750 billion in uncleared notional swap position. By September 2021, the threshold for the rule is scheduled to decline to $50 billion, and then decline again to $8 billion in September, 2022. As Table 1 indicates, the consequence of these future changes is important because the number of entities above the nominal position threshold will increase dramatically. Furthermore, many market participants have argued that such a change would strain industry resources. (See Haynes, Lau, and Tuckman, 2018.)

A key to analyzing the impact of the rule is to notice that, while notional and ENNs are related, their relationship is imperfect. In particular, many entities have large notional amounts, but relatively small ENNs. Figures 1 and 2 illustrate this point. Figure 1 shows the relationship between notional amounts and ENNs for entities in our population that have an uncleared notional amount below $5 trillion.[22] Overall, the two measures move closely together: Entities with more than $500 billion in uncleared notional all have more than $20 billion in uncleared ENNs, and entities with less than $100 billion in uncleared notional all have less than $90 billion in uncleared ENNs. For this subsample, the correlation between notional and ENNs is about 98%.

FIGURE 1 about here

At a different scale, however, important differences emerge. Figure 2 shows entities with uncleared notional positions between $8 billion and $50 billion, which is a particularly relevant range because the threshold for being a covered entity is scheduled to fall to $8 billion. This figure shows that the relationship between uncleared notional amount and uncleared ENNs is fairly weak in this subsample of entities. In contrast to the correlation in Figure 1, the correlation between uncleared notional and ENNs for entities in this figure is only about 29%. In short, a threshold in terms of notional amount does not accurately separate entities by their ENNs and, therefore, by their potential to contribute to systemic risk.

Looking at specific groups of entities with notional between $8 billion and $50 billion yields some insight into relationship between duration and the differences between ENNs and notional. About 10% of these entities have ENNs less than $1 billion, and a similar number have ENNs greater than their notional amounts. In regard to the former group, the reason for the large disparity is that most of the

[22] Note that the scale of the graph makes it difficult to appreciate the very large number of observations with notional below $1 billion.

swaps involving these entities are short duration; on average, the notional value of their swaps is more than five times the value when converted to 5-year equivalents. For these entities, notional overstates risk exposure because of the short duration of their swaps. Not surprisingly, the converse is true for the entities for whom ENNs is greater than notional; these entities tend to make long-duration swaps, and their value in 5-year equivalents is three times the notional value. As a baseline, note that on average for all entities with notional between $8 billion and $50 billion, average duration is not too different from 5 years, as the reduction due to converting to 5-year equivalents is only about 12%.

FIGURE 2 about here

Finally, looking at entities in isolation may be somewhat misleading, in that the literature suggests that the correlation of positions is also important. Table 2 presents some evidence on the correlation of positions of the 202 entities with uncleared notionals between $8 and $50 billion. We find that about 1/3 of entities with notional in this range are either nearly all short (their short ENNS is more than 90% of their total ENNs) or nearly all long (their long ENNs is more than 90% of their total ENNs). There is a relatively even split between those that are nearly all short and nearly all long. Since these portfolios consist of interest rate swaps, returns are largely determined by changes in market interest rates, so that these statistics suggest that the returns to the assets of entities in this range are not highly correlated. Following the logic of Adrian and Brunnermeier, it follows that entities in this range are less likely to cause systemic crises than larger entities with the same aggregate ENNs.

TABLE 2 ABOUT HERE

V. Conclusion

Many financial regulations distinguish between entities of different sizes, because imposing the fixed costs of the regulations on smaller entities is often perceived as not justified by any accompanying reductions in systemic risk. Defining "small" in the derivatives context, however, is not straightforward. Following Haynes *et al.* (2018), we argue that notional amount, the metric most commonly used in derivatives regulation, is a flawed measure of risk relative to entity-netted notionals, or ENNs, which reflects the risk-transfer inherent in an entity's positon. We shed light on the empirical significance of the difference between ENNs and notional by evaluating the exemption of entities from the mandate to post margin for uncleared swaps, which will continue to be phased in over the next 30 months. We show that a threshold based on notional amount gives very different results from one based on ENNs. More specifically, for the set of entities that will be newly-subject to the mandate, the correlation

between ENNs and notional is less than .3. We show that that many entities that contribute relatively little to systemic risk will be subject to the mandate under the current metric.

ENNs represents a tool that regulators can use to identify, and target regulation at, entities most likely to contribute to systemic risk. Specifically, if regulators set standards for inclusion under the UMR and similar statutes based on ENNs rather than notional amount, it would better comport with the concept of size implicit in the systemic risk literature, and their goal of minimizing systemic risk.

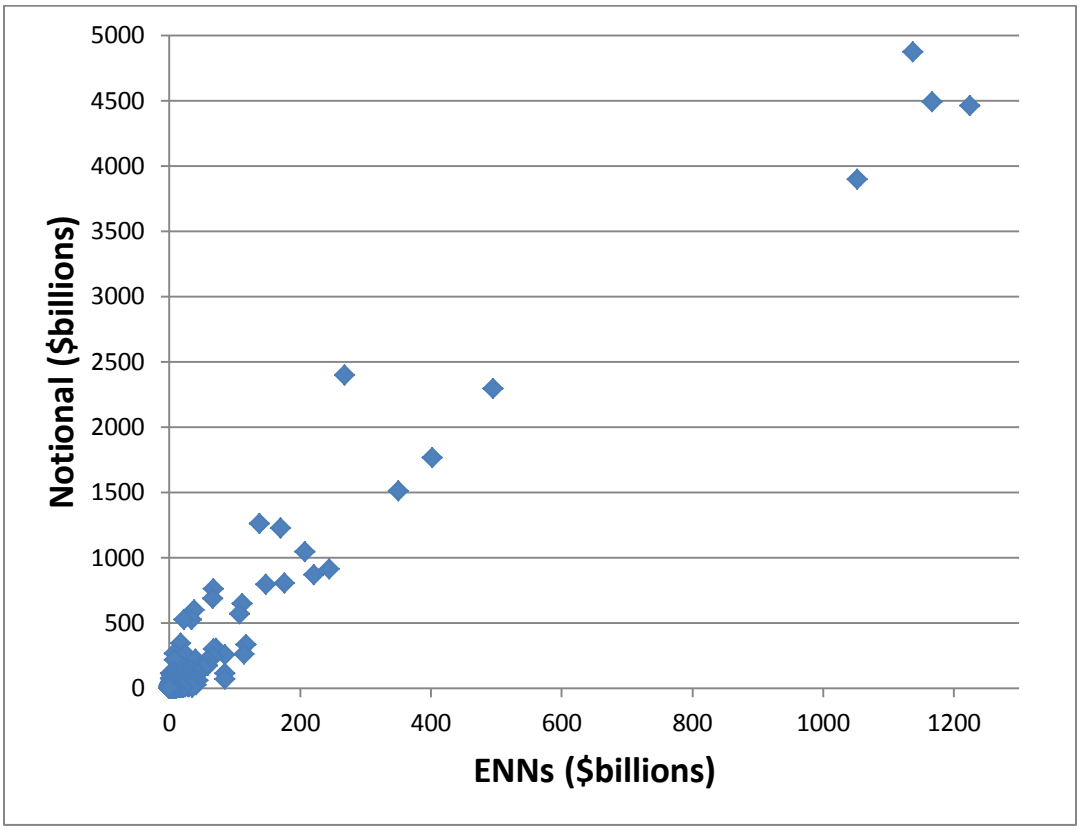

Figure 1

Figure 1 shows the relationship between IRS ENNs and notional position for entities with uncleared notional below $5 trillion.

Source: Data submitted under Part 45 of the Commodity Exchange Act.

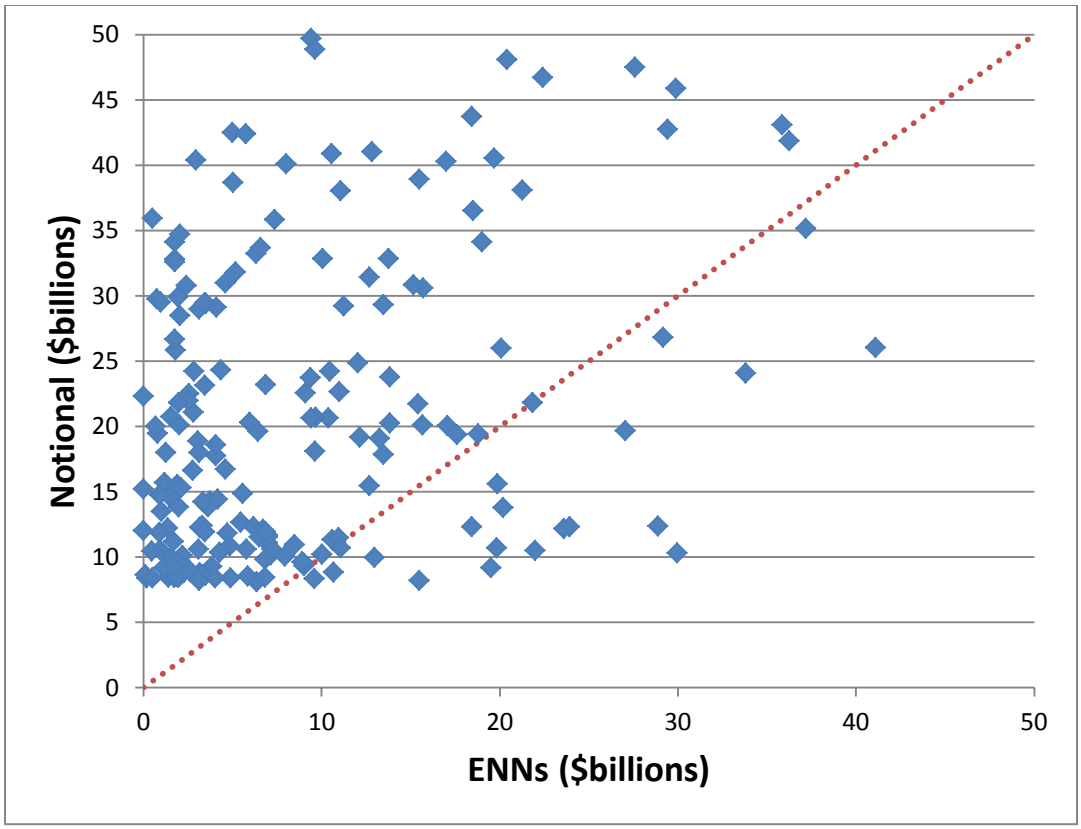

Figure 2

Figure 2 shows the relationship between IRS ENNs and notional for entities with uncleared notional between $8 and $50 billion.

Source: Regulatory data under part 45 of the Commodity Exchange Act.

	Notional Value Categories ($ Billions)			
	< 8	8-50	50-100	> 100
Number of Entities	51,110	202	28	52
Agg Notl ($B)	4,150	4,224	2,022	48,516
Agg ENNs ($B)	2,576	1,800	776	11,076

Table 1 – Distribution of Notional Sizes

This table shows the number of entities in various size categories of uncleared IRS notional position. The notional and ENNs amounts are the sums of all positions for entities in each category.

	Short	Neutral	Long
Number of Entities	34	35	28
Agg Notl ($B)	593	770	496
Agg ENNs ($B)	274	291	375

Table 2 – Positions of entities with notional between $8 and $50 billion.

This table shows the number of entities and their positions for entities with almost-exclusively short ENNs (more than 90% short), long ENNs (more than 90% long) and neutral (between 40 and 60% short) positions, out of the 202 entities in that size range.

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