GLOBAL RELATIONS FORUM YOUNG ACADEMICS PROGRAM
POLICY PAPER SERIES No.6

PRIME BROKERAGE BUSINESS MODELS

DR. EGEMEN EREN

Stanford University, Ph.D. in Economics
Economist, Bank for International Settlements

GİFGRF

Global İlişkiler Forumu Global Relations Forum

GLOBAL RELATIONS FORUM YOUNG ACADEMICS PROGRAM POLICY PAPER SERIES No.6

PRIME BROKERAGE BUSINESS MODELS

Dr. Egemen Eren

Stanford University, Ph.D. in Economics
Economist, Bank for International Settlements

Global Relations Forum Young Academics Program
Policy Paper Series No.6

Prime Brokerage Business Models

by Dr. Egemen Eren

February 2018

ISBN: 978-605-83113-4-3

Publisher Certificate No: 22780

Printed in Turkey
Gren Agency, Istanbul. www.grenajans.com

Please direct inquiries to:

GLOBAL RELATIONS FORUM
Yapı Kredi Plaza D Blok Levent 34330
Istanbul, Turkey
T: +90 212 339 71 51 F: +90 212 339 61 04
www.gif.org.tr | *info@gif.org.tr*

This publication can be downloaded at gif.org.tr

Contents

About GRF

Global Relations Forum (GRF), founded in 2009 with the support of prominent Turkish leaders in business, government and academia, is an independent, nonprofit membership association providing a platform for engaging, informing, and stimulating its members and all interested individuals in all matters related to international affairs and global issues.

GRF intends to advance a culture that rewards the fertile tension between passion for intellectual diversity and dedication to innovative and objective synthesis. It nurtures uninhibited curiosity, analytic inquiry, rational debate, and constructive demeanor as the elemental constituents in all its endeavors. It contributes to the shared understanding of and aspiration for humanity's path to peace, prosperity, and progress as an accessible, inclusive, and fair process for all.

About the GRF Young Academics Program

Global Relations Forum community programs aim to advance a culture of intellectual diversity, rational and constructive debate, and analytic coherence.

The GRF Young Academics Program is distinct among these community initiatives in that it serves an additional but equally important objective. Through this program, GRF is establishing an expanding network of young academics that contributes to policy discussions in both the national and international spheres.

The program is designed to culminate in the publication of either a policy or an analysis paper authored by the young academic, which is then published as part of the Policy Paper Series or the Analysis Paper Series. The author benefits from the experience of GRF members in crafting her paper. However, the publication reflects the views of the young academic and not the institutional views of GRF or the individual positions of the commission members.

This paper entitled *"Prime Brokerage Business Models"* is authored by Dr. Egemen Eren as part of the *GRF Young Academics Program Policy Paper Series*. GRF thanks him for his contribution and commitment to this effort.

GRF convened the following group of distinguished members to evaluate and guide Dr. Egemen Eren's paper:

Tayfun Bayazıt
Vice-Chairman, TÜSİAD (F); Chairman, Bayazıt Consulting; Chairman (F), Yapı Kredi Bank

Hasan Ersel
Member of Board of Trustees, TEPAV; Deputy Governor of the Central Bank of Turkey (F)

Memduh Karakullukçu
Vice Chairman and President of GRF

Durmuş Yılmaz
Senior Advisor to the President of Turkey (F); Governor of the Central Bank of Turkey (F); Member of Directors' Council, TEPAV

GRF is grateful to all members who participated in the evaluation commission for their invaluable insights and informed guidance, as well as for the time and effort they dedicated to the program.

Global Relations Forum

About the Author

Dr. Egemen Eren is an economist at the Bank for International Settlements. He received his Ph.D. in Economics from Stanford University in 2016, his master's degree in Economics from Universitat Pompeu Fabra in 2010 and his B.A. in Economics from Bilkent University in 2008. His research interests include the functioning of financial markets, with a focus on financial intermediation and international finance.

Global Relations Forum Young Academics Program
Policy Paper Series No. 6

Prime Brokerage Business Models

Dr. Egemen Eren

Stanford University, Ph.D. in Economics
Economist, Bank for International Settlements

egemeneren@gmail.com

The views expressed here are those of the author only, and do not reflect the view of the Bank for International Settlements.

Abstract

This paper provides a survey of the relationship between prime brokers and hedge funds and the business model of prime brokers. Prime brokers mainly finance the long positions of hedge funds and lend them securities for their short positions. This paper focuses on this feature of the prime broker and hedge fund relationship. Prime brokers have an efficient business model which relies on running a matched-book. A matched-book is employed by finding counterparties to trade with such that effectively the funds one borrows are equal to the funds one lends. Along the way, the market risk is reduced and profits are made from intermediation spreads. There are additional cost reductions from intermediating between two different clients, a practice called internalization. In the case of collateral re-use, the difference between the haircuts applied can generate liquidity for the broker. Furthermore, free credit balances of hedge funds held at prime brokers are also partly available for brokers to use for their own purposes.

Even though the prime brokerage business model works seamlessly in normal times, it is run-prone and systemically important, as was highlighted during the financial crisis. Guided by the main features of the prime brokerage model, I discuss data needs in order to understand the prime brokerage market better. I also discuss the main parts of the business model that are affected by the Basel III regulations.

1. Introduction

Prime brokers are systemically important financial institutions that contributed to and were affected by the financial crisis. Prime brokers are typically units of large, global investment banks that provide services to hedge funds. Some of the main services they offer to hedge funds are to provide them leverage and finance their long positions and lend them securities for their short positions.

Hedge funds are large investment funds that use private investment strategies and are loosely regulated. They often use both long and short positions to implement their trading strategies. Not widely available to the public, they raise initial capital from institutional investors and high-wealth individuals. Hedge funds often employ leveraged long and short positions to amplify returns from their investments.

The crux of the hedge fund and prime broker relationship is the leverage and financing that a prime broker can offer a hedge fund.[1] Except for a few large hedge funds, hedge funds do not have access to unsecured debt financing, and their borrowing needs to be backed by collateral. The main sources of leverage for a hedge fund are collateralized borrowing through repurchase agreements, securities borrowing and collateralized borrowing through margin loans, or through either exchange traded or Over-the-Counter (OTC) derivative agreements, which are broadly called synthetic prime brokerage.[2]

Prime brokers have a very efficient funding model in normal times, in which they run a matched-book, repledging collateral obtained from a hedge fund to other counterparties and intermediating funds and collateral, earning a spread from this intermediation. Furthermore, prime brokers have had access to free credit balances of hedge funds which are all the cash hedge funds keep in their accounts at the prime broker in excess of the amount held as collateral. However, during the financial crisis, prime brokerage was an important driver of the crisis as a result of a run by hedge funds at distressed prime brokers, affecting the entire global banking sector due to its interconnected nature.

Prime brokers hold collateral and cash owned by hedge funds in their accounts; when the risk of the parent banks of prime brokers became apparent, it was a run by hedge funds to prime brokers, since in case of the bankruptcy they risked losing those assets.[3] For Lehman Brothers, according to company reports, the amount was a sizable $9 billion in three days, between September 9 and 12, 2008. Similarly, Morgan Stanley lost $56.4 billion in 10 days, between September 12 and September 22, 2008 (Duffie, 2013).

Regulatory measures after the crisis aimed to make prime brokerage safer and reduce the adverse systemic effects. In this paper, I provide a survey of the existing research on prime brokerage business models and analyze the risks inherent in the funding mechanisms of prime brokers. I then highlight data necessary to better understand this market and describe how this market is affected by the current regulatory framework.

---

[1] For other explorations of the hedge fund and prime broker relationships, see Aikman (2010), Brunnermeier and Pedersen (2009), Kirk et al. (2014), Duffie (2010) and Eren (2015)

[2] Margin loans and repurchase agreements serve the same economic purpose, which is secured lending. However, they have some distinctions as to how they are treated legally in terms of their balance sheet treatment. See King (2008) for the legal distinctions

[3] See Duffie (2010)

2. Prime Brokers and Hedge Funds

Prime brokers provide many services to hedge funds, such as providing leverage for long positions, financing short positions and acting as a counterparty for derivative exposures, among others. This section provides a brief overview of the relationship between prime brokers and hedge funds.

Collateralized Financing: Standard Prime Brokerage

Hedge funds often employ leverage to amplify the returns from long positions. A long position typically involves the hedge fund borrowing funds from the prime broker and posting securities as collateral. In a repo agreement, the prime broker and the hedge fund agree on the principal amount, interest rate, collateral type, haircut (or margin amount) and tenor of the agreement. Since this is similar to a secured loan, the prime broker chooses the haircut (or margin) to protect itself from the downside in the case that the hedge fund defaults. For example, if the hedge fund wants to take a position worth $100 on a stock and the prime broker and the hedge fund agree on a 10% haircut, the prime broker buys the stock from the hedge fund for $90 at the opening leg of the agreement and agrees to sell it back to the hedge fund for $90 plus the interest rate at the settlement date. The prime broker is protected up to 10% downside, since it could sell the securities in the market and recover the amount it lent to the hedge fund in case the hedge fund defaults and is unable to buy the security back from the prime broker.

Hedge funds also employ shorting strategies. A short position typically involves a hedge fund borrowing a security from the prime broker and then selling it in the market. The hedge fund then posts collateral, typically in excess of the market value of the securities sold, to protect the prime broker from an increase in the value of the security. A hedge fund creates a short position if it believes that a security is overvalued and will lose its value. This is when the fund buys the security back from the market, then delivers it back to the prime brokers and pays the shorting fees that they agreed upon at the opening leg of the shorting agreement. The prime broker also returns the collateral posted by the hedge fund. The risk for a prime broker in this situation arises if the price of the security goes above the amount of excess collateral posted by the hedge fund, in case the hedge fund is not able to redeliver the securities. If the prime broker wishes to re-buy the security, it would have to buy it at the higher market price.

Synthetic Prime Brokerage

A relatively new and emerging way to create the desired exposures for a hedge fund is through synthetic prime brokerage. It is called “synthetic” since it aims to create the same exposure for a hedge fund without having to own the underlying instruments directly. The most common use of synthetic prime brokerage is through “delta one” instruments, which strive to replicate the return of an underlying one-to-one, such as total return swaps.

A total return swap works as follows. The parties agree on an exposure to a certain reference asset. The party who owns the reference asset receives a set rate and makes payments to the other party based on the total return received from the reference asset. This creates economically similar exposure for the hedge funds, without having to own the security and by just posting the margin required for the transaction.

In addition to total return swaps, prime brokers also offer services to hedge funds in other derivatives contracts through futures, options, interest rate swaps, credit default swaps etc.

Regulation T and Portfolio Margining

In the US, for equities, Regulation T requires non-broker-dealers to post at least 50% of the market value of the asset as initial margin, both in long and short positions. There are several ways to mitigate the impact of that regulation. Prime brokers that finance multiple positions of a hedge fund could offer lower margin requirements for the hedged positions of a hedge fund since the multiple positions of a hedge fund could be partially offsetting risks compared to security-by-security margining.

Additional Services Provided by a Prime Broker

In addition to providing leverage to clients through financing of long positions and securities lending, prime brokers offer other services to hedge funds such as custody, trade execution, trade settlement, trade reporting, capital introduction etc. (Aikman, 2010).

3. Prime Brokerage Business Model

As explained in Section 2, the main service provided by a prime broker to a hedge fund is to provide financing for long positions, to provide securities for short positions through margin loans, repurchase agreements and reverse repurchase agreements and to enter into derivatives contracts.

3.1 Standard Prime Brokerage: Margin Loans and Repurchase Agreements

To illustrate the financing mechanism used by prime brokers, suppose the prime broker initiates a long position for a hedge fund as shown in Figure 1.

The hedge fund is able to obtain a long position in the asset that is worth $\$lp_t$ where l is the number of shares bought and p_t is the market price for one share. To obtain that position, the hedge fund used $\$lp_t h_l$ of its own capital, where $h_l \in [0, 1]$ is the haircut that the hedge fund and the prime broker agreed upon in the contract. The hedge fund is able to obtain the rest of the funds from the prime broker by pledging l shares bought as collateral and obtaining $\$lp_t(1 - h_l)$ from the prime broker.

In a repurchase agreement, after extending $\$lp_t(1 - h_l)$ to the hedge fund, in exchange for l shares, the prime broker has three options.

First, it could keep the asset in its inventory for the duration of the repo contract, which would lock up $\$lp_t(1 - h_l)$ of cash that could have been used for other purposes.

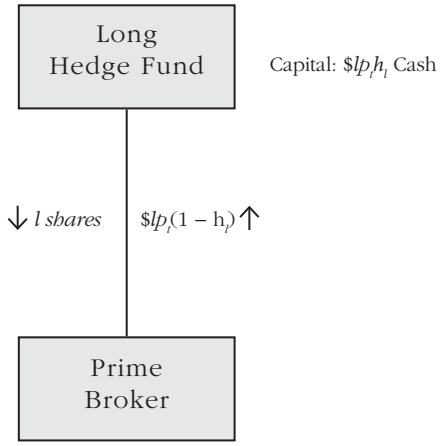


Figure 1: Opening leg of a repurchase agreement for a long position.

The key element of the prime brokerage business model is the following:

The prime broker is able to obtain financing by repledging the securities obtained as collateral from hedge fund clients.[4] As Figure 2 illustrates, the prime broker intermediates between a hedge fund and third party cash investors. The prime broker obtains collateral from the hedge fund and repledges it to cash investors and provides cash that it obtains from cash investors to the hedge fund. The prime broker then earns the spread between the two interest rates at the end of the tenor of the contract. For a short position the process is reversed, but the main mechanism is similar.[5]

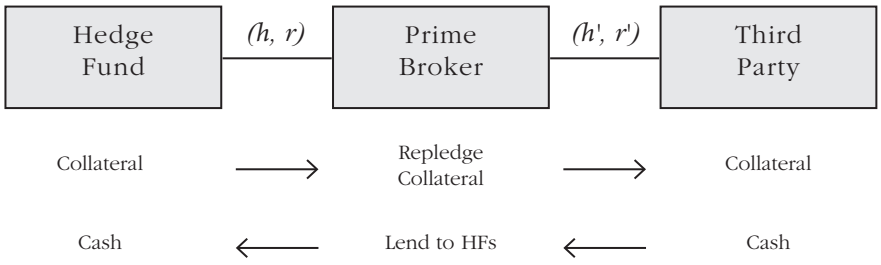


Figure 2: Repledging hedge fund securities.

Intermediation by repledging customer collateral forms the key part of the business model of prime brokerage. However, when the prime broker repledges customer collateral, there is a key distinction in terms of costs, whether this intermediation is done externally by repledging collateral to some external counterparty (such as a money market fund etc.) or internally between two hedge fund clients.

---

[4] There is an emerging literature on rehypothecation. For further reference, please see Singh and Aitken (2010), Kirk et al. (2014), Infante (2015) and Eren (2014)

[5] Kirk et al. (2014), Infante (2015) and Eren (2014) suggest that the differences in the haircuts could also generate extra funding for the prime broker's own purposes. I discuss this in Section 4

Matched-Book vs. Internalization

A prime broker that does not run a matched-book or internalize positions between clients would either have to borrow on an unsecured basis to finance a hedge fund client's position or forgo any alternative use of the funds lent to the hedge fund. Both of these are quite costly and not effective ways to finance the billions of dollars of positions taken by hedge funds.

Repledging securities obtained through repos or margin loans provides an efficient use of collateral obtained. The prime broker then has two alternatives with the obtained collateral in a secured transaction: matched-book and internalization. Kirk et al. (2014) provides an excellent summary of how matched-book and internalization works in practice, legal differences and the balance sheet treatment of each. In this subsection, I provide a summary that mostly draws from their work.

Matched-book involves repledging collateral to an external counterparty such as an asset manager, a money market fund etc., that is looking to earn returns overnight for their unused cash sources. This works similarly for a short position. A securities lender, such as a pension fund that owns an asset, looks to lend its securities to enhance returns.

In a matched-book transaction, a prime broker that finances the position of its client would need to search for a counterparty to repledge customer collateral. The profits of the prime broker would be the difference between the interest rate and/or fees that it receives from its hedge fund client and the interest rate it pays to the external counterparty. An additional source of profits for the prime broker could arise from using proceeds from any haircut differences between the two transactions to fund its own positions, as in Eren (2014) and Infante (2015).

In the case of internalization, the prime broker matches the long position of one client with the short position of another. This improves collateral efficiency for the prime broker's operations. It saves search costs to find an external counterparty. Furthermore, the prime broker is able to generate returns through interest rates on long positions and shorting fees from the short position. In addition, as Kirk et al. (2014) demonstrate, under US GAAP accounting rules, internalization also uses balance sheet space more efficiently compared to matched-book. Through favorable netting arrangements and the possibility of transferring operations off-balance sheet, the prime broker is able to extend the same amount of credit with less of it appearing on balance sheets compared to matched-book. Eren (2015) estimates the cost savings from internalization to be $100-200 million for large prime brokers.

For a prime broker, internalization offers sizable benefits compared to matched-book, by reducing search costs, increasing fees and commissions earned and using the balance sheet more efficiently. However, internalization exposes the prime broker to a different set of risks. In a matched-book transaction, when the prime broker pledges customer collateral to an external counterparty, the recipient of the securities is usually a money market fund or a mutual fund, which does not repledge the security further and acts as a custodian of those assets. Therefore, for a long position of a client, the prime broker only faces risk when the market price of the collateral falls below the value protected by the margin or haircut. Conversely, for a short position, the prime broker faces a risk of a loss when the market price of the underlying security goes above the value protected by the margin.

On the other hand, when the prime broker internalizes the client positions, extreme movements in the market price of the collateral in either direction pose risks for the prime broker. To illustrate, suppose the prime broker enters into a repo agreement. It obtains securities as collateral and extends cash to a client to get a long position, with a contractually specified haircut. The prime broker then repledges that security to another client. The second client sells the security in the market and pledges the proceeds from the sale and extra cash as collateral.

In the closing leg, if the price of the security falls below the value protected by the haircut and the hedge fund defaults or decides to unwind its position, the prime broker would be forced to sell the security to the market at low and unfavorable prices in order to repay the cash that was pledged by the shorting hedge fund. This results in a loss for the prime broker.

Conversely, if the price goes above the amount protected by the cash collateral pledged by the shorting hedge fund and the hedge fund defaults or decides to unwind its position, the prime broker would need to buy those securities from the market at high prices to give it back to the long hedge fund. This also results in a loss for the prime broker.

3.2 Synthetic Prime Brokerage: Derivatives

Derivatives contracts are in many ways similar to the repo agreements and margin loans explained in the previous section. When a prime broker sells a derivative contract to a client, it has an exposure to the underlying asset. From a risk management perspective, it would be ideal to find a different counterparty to purchase an opposite exposure with an equal amount for hedging purposes. In the process, the prime broker would earn a spread similar to repo intermediation. Furthermore, as in repo intermediation, the prime broker could potentially get financing for itself if it posts a lower margin when purchasing a contract, than when it sells a contract to a client.[6]

Similar to repos and margin loans, intermediating derivatives positions of two clients would be less costly due to lower costs and potentially more favorable deals for the prime broker, compared to deals with external counterparties. Similar to repos and margin loans, intermediating derivatives positions of two clients would be less costly due to lower costs and potentially more favorable deals for the prime broker, compared to deals with external counterparties. Although the prime brokers are able to minimize risks due to price movements by intermediating opposite positions in derivatives, counterparty risks still remain. This is because the prime broker would still have contractual obligations toward one customer if the other customer defaults.

3.3 Hedge Fund Free Credit Balances

Another important component of the prime brokerage business model is the free credit balances of hedge funds. Free credit balance refers to the cash held by a hedge fund in its margin account that in excess of margin requirements, short sale proceeds etc., that the hedge fund has the right to demand on short notice.[7]

---

[6] For balance sheet treatment of derivatives and derivatives collateral, see Kirk et al. (2014)

[7] See Baily et al. (2010) for further information

When a hedge fund has free credit balances and another hedge fund needs cash for a margin loan etc., the prime broker could channel funds from the margin account of the client with excess cash to the account of the client that needs cash.

The risk in this process is the possibility of withdrawal of free credit balances at a short notice. If the hedge fund with excess cash withdraws the excess cash on its margin account, the prime broker needs to come up with funds to pay that hedge fund, since the cash is locked in the loan of another hedge fund.

The use of free credit balances is important both for the business model of the prime broker and for the systemic risk it creates. This is the most similar prime brokerage gets to the traditional banking system, where free credit balances are similar to deposits and the margin loans funded by free credit balances are similar to loans made to business. However, there is one difference: There is no deposit insurance between prime brokers and hedge funds.

4. Haircuts as a Liquidity Source for Prime Brokers

A byproduct of intermediation for prime brokers is as follows:

If the collateral obtained from one side of the transactions is greater than the collateral pledged to the other side of the transaction, this creates liquidity for a prime broker, as explained in Kirk et al. (2014), Infante (2015) and Eren (2014). This mechanism works as shown below for repo agreements.[8]

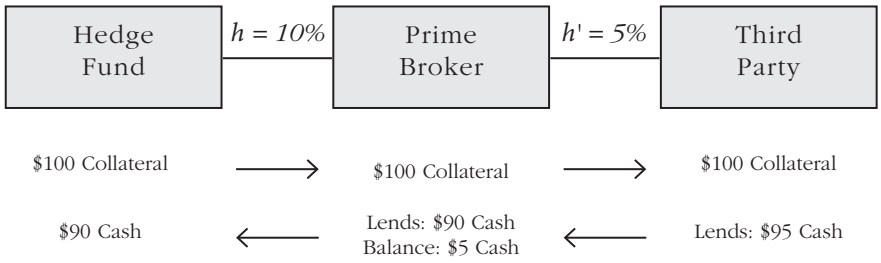


Figure 3: Intermediation and liquidity creation by rehypothecation. By repledging a hedge fund's collateral, a dealer bank intermediates cash between the hedge fund and the third party. If the dealer bank charges a higher haircut than it faces, it can obtain liquidity to use for its own purposes. The total liquidity it obtains amounts to the value of the collateral multiplied by the difference in haircuts.

When a prime broker is given the right to repledge collateral and exercises this right, the title to the collateral is transferred to the third party. Moreover, repos are exempt from automatic stay in the event of bankruptcy. Hence, in the event of bankruptcy by a prime broker, cash investors can liquidate the collateral. Hedge funds would in this case need to present claims for their losses in bankruptcy proceedings. Hedge funds are exposed to ultimate loss to the extent of the haircut on their collateral. For example, suppose a hedge fund borrows $90 cash from a

[8] This section is largely based on the discussion in Eren (2014)

prime broker by pledging collateral, with a market value of $100. The haircut is 10%.[9] For simplicity, suppose the interest rate is zero. Further suppose that the prime broker then repledges the collateral to a money market mutual fund. If the prime broker goes bankrupt, then the money market mutual fund will liquidate the collateral. The final leg of the repo will not settle. The prime broker is unable to return the collateral and hedge funds will not repay. The hedge fund will present a claim for $100 – $90 = $10 in the bankruptcy of the prime broker, and recover some fraction of this claim, pro rata with unsecured creditors. Higher haircuts thus increase the expected default loss for the hedge fund.

The magnitude of liquidity generated through this mechanism could be substantial, around several billion dollars for each prime broker, though this is not a very precise estimate due to data limitations. As Eren (2014) shows, if prime brokers rely on the liquidity generated through this mechanism, in a crisis that features a substantial reduction in the amount of lending by third parties, this could result in stress for prime brokers and their parent banks, important players of the global financial markets.

5. The Impact of the Financial Crisis and Subsequent Regulation Affecting Prime Brokerage

Prime brokerage proved to be systemically important during the financial crisis.[10] The crisis and the subsequent regulatory measures have been changing the prime brokerage business model.

According to a JPMorgan report (2014), Basel III regulations have changed the prime brokerage business model. Basel III increases capital requirements, proposes a higher leverage ratio and introduces liquidity coverage ratio and net stable funding ratio. Capital requirements and leverage ratio make balance sheet usage (and also off-balance sheet) more costly for parent banks through prime brokers. Repos and margin loans, being balance sheet-intensive funding mechanisms, affect the pricing and availability of services to clients. On the face of it, this would make internalization more attractive to prime brokers since it is able to generate higher returns, with fees and interest rates charged to clients both for long and short positions. Furthermore, for the US banks, under US GAAP rules, it economizes on balance sheet space.

However, liquidity coverage ratio (LCR) makes internalization costly as well. LCR aims to reduce the liquidity risk at banks. LCR imposes that the bank should hold enough high-quality liquid assets for a 30-day stress scenario, where customers withdraw 100% of their free credit balances and internalization is reduced to 50% among others. The JPMorgan report views the rule on internalization as follows:

[9] Haircut = (100-90)/100

[10] Duffie (2010) provides a summary of the mechanisms by which prime brokers were affected

"One of the most notable rule changes is the significant reduction in internalization value that a Prime Broker can realize from customer activity. Internalization, or the ability to use the encumbered assets of one customer to cover the shorts of another customer, is reduced to 50% under new rules. This will have ramifications for hedge fund strategies that have benefited from pricing that reflects the value of internalization to the prime broker (It is more efficient and less costly for the prime broker to use [one] client's securities to cover another client's shorts than to borrow the securities from an agent lender.)..." JPMorgan (2014).

Overall, these rules alter the prime broker business model, affecting matched-book, internalization as well as off-balance sheet funding mechanisms. Whether it will have a differential impact on the use of these mechanisms is an open question that should be addressed.

6. Data Needs

The components that make up the business model of prime brokers, matched-book, internalization, derivatives, hedge fund free credit balances and liquidity generated through haircuts or derivatives collateral, all contribute differently to the systemic risks generated by the prime brokerage industry. For a complete understanding of the business model, the existing data is very incomplete.

In order to quantitatively assess all features of the prime brokerage business model contributing to systemic risk and evaluate the impact of regulation, micro level data on prime brokers should be collected. The data should specify the nature of contracts, whether they are repo contracts, margin loans or derivatives contracts. Furthermore, a more complete map of intermediation should be traced. That is, the counterparties to whom prime brokers repledge collateral obtained from clients should be traced, to analyze the quantitative importance of internalization and the systemic risks created by this intermediation. Moreover, data on repo haircuts and derivative collateral pledged should be collected in order to get a more reliable measure of the liquidity prime brokers obtain this way.

7. Conclusion

Nine years after the financial crisis, which had prime brokers at its center, prime brokers remain systemically important institutions. In this paper, I highlighted the main features of the prime brokerage business model, and how they generate revenues for the prime brokers and how they contribute to systemic risks in global financial markets. I also evaluated the potential impact of current liquidity-related regulatory efforts and proposed a roadmap for data collection to better evaluate the risks in the prime brokerage industry.

References

Aikman, Jonathan S. *When prime brokers fail: the unheeded risk to hedge funds, banks, and the financial industry.* Hoboken, NJ: Bloomberg Press/Wiley, 2010.

Baily, Martin N., Andrew B. Bernard, John Y. Campbell, John H. Cochrane, Douglas W. Diamond, Darrell Duffie, Kenneth R. French, Anil K. Kashyap, Frederic S. Mishkin, Raghuram G. Rajan, David S. Scharfstein, Robert J. Shiller, Hyung Song Shin, Matthew J. Slaughter, Jeremy C. Stein, and René M. Stulz. *Prime brokers and derivatives dealers*. Technical paper. Greenberg Center for Geoeconomic Studies, Council on Foreign Relations. Squam Lake Working Group on Financial Regulation, 2010.

Brunnermeier, Markus K., and Lasse Heje Pedersen. "Market liquidity and funding liquidity." *Review of Financial Studies* 22, no. 6 (June 1, 2009): 2201-238. doi: https://doi.org/10.1093/rfs/hhn098.

Duffie, Darrell. *How Big Banks Fail and What to Do About It*. Princeton, NJ: Princeton University Press, 2011.

Duffie, Darrell. "Replumbing Our Financial System: Uneven Progress." *International Journal of Central Banking,* 1st ser., 9 (2013): 251-79.

Eren, Egemen. *Intermediary Funding Liquidity and Rehypothecation as Determinants of Repo Haircuts and Interest Rates*. Working paper. Department of Economics, Stanford University. 2014.

Eren, Egemen. *Matching Prime Brokers and Hedge Funds*. Working paper no. 16-014. SIEPR, Stanford University, 2015.

Infante, Sebastian. "Liquidity Windfalls: The Consequences of Repo Rehypothecation." *SSRN Electronic Journal*. doi:10.2139/ssrn.2670948.

King, Matt. *Are the Brokers Broken*. Report. Citigroup European Quantitative Credit Strategy and Analysis, 2008.

Kirk, Adam, James McAndrews, Parinitha Sastry, and Philip Weed. "Matching Collateral Supply and Financing Demands in Dealer Banks." *FRBNY Economic Policy Review*, December 2014, 127-51.

Leveraging the Leverage Ratio - Basel III, *Leverage and the Hedge Fund-Prime Broker Relationship Through 2014 and Beyond*. JPMorgan Report. JPMorgan, 2014.

Singh, Manmohan, and James Aitken. *The (Sizable) Role of Rehypothecation in the Shadow Banking System*. Working paper. International Monetary Fund. 172nd ed. Vol. 10. 2010.

GRF Young Academics Program Publications

The *GRF Young Academics Program Publications* consist of policy and analysis paper series written by the participants of the Young Academics Program. While both series are concerned with thoroughly analyzing a topic of interest, policy papers additionally propose policy recommendations.

The Young Academics Program and its publications are directed by Burcu Baran Türem, GRF Director of Policy Communities.

GRF Program Director Selin Uğurtaş is the editor of the series.

For further information, please contact GRF at info@gif.org.tr.

Following is a list of papers published under the *GRF Young Academics Program Publications*:

Policy Paper Series

No: 1

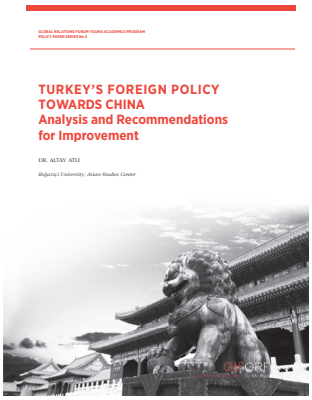
"Turkey in the Eurasian Energy Game" by Onur Çobanlı

Humboldt-Universität zu Berlin, Ph.D. in Economics and Management Science

No: 2

"Pipeline Partners: Expanding and Securing Iraq's Future Oil Exports" by Dr. John V. Bowlus

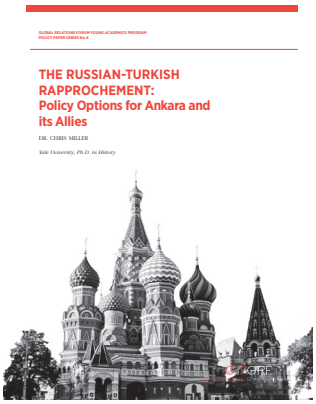
Georgetown University, Ph.D. in History



No: 3

"Turkey's Foreign Policy Towards China Analysis and Recommendations for Improvement" by Dr. Altay Atlı

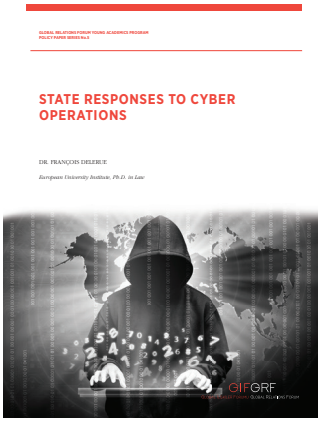
Boğaziçi University, Ph.D. in International Relations and Political Science



No: 4

"The Russian-Turkish Rapprochement: Policy Options for Ankara and its Allies" by Dr. Chris Miller

Yale University, Ph.D. in History

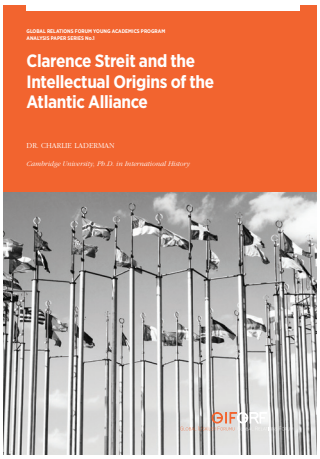


No: 5

"State Responses to Cyber Operations"
by Dr. François Delerue

European University Institute, Ph.D. in Law

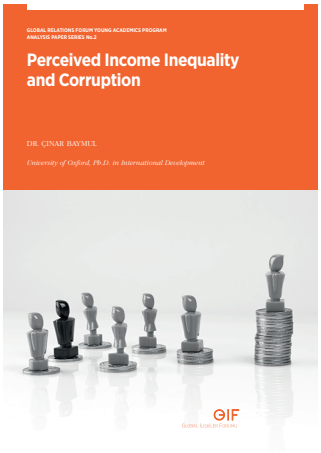
Analysis Paper Series



No: 1

"Clarence Streit and the Intellectual Origins of the Atlantic Alliance" by Dr. Charlie Laderman

Cambridge University, Ph.D. in International History



No: 2

"Perceived Income Inequality and Corruption" by Dr. Çınar Baymul

University of Oxford, Ph.D. in International Development
Consultant, University of Manchester

All of GRF's publications, including GRF Young Academics Program Publications, can be downloaded from gif.org.tr.

Global Relations Forum Young Academics Program
Policy Paper Series No.6

Prime Brokerage Business Models by Dr. Egemen Eren

February 2018

GİFGRF

Global İlişkiler Forumu Global Relations Forum

The GRF Young Academics Program brings together young academics who are currently pursuing or have recently completed their doctoral studies. The goal of this program is to provide a forum for accomplished young academics to discuss and define long-term policy challenges.

The GRF Young Academics Program Publications consist of policy and analysis paper series written by the GRF's Young Academics.

Through this program, GRF is establishing an expanding network of young academics to enrich policy discussions in both the national and international spheres.

For more information about the Global Relations Forum and the GRF Young Academics Program, you can visit:

www. gif.org.tr

Dr. Egemen Eren is an economist at the Bank for International Settlements. He received his Ph.D. in Economics from Stanford University in 2016, his master's degree in Economics from Universitat Pompeu Fabra in 2010 and his B.A. in Economics from Bilkent University in 2008. His research interests include the functioning of financial markets, with a focus on financial intermediation and international finance.

Global Relations Forum
Yapı Kredi Plaza D Blok
Levent 34330 Istanbul, Turkey
T: +90 212 339 71 51
F: +90 212 339 61 04
www.gif.org.tr

GİFGRF
GLOBAL İLİŞKİLER FORUMU GLOBAL RELATIONS FORUM