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QUASI-RISK AND FRAUDULENT FINANCING MODELS: THE CASE OF FIRMS WITH NEGATIVE EQUITY IN UKRAINE[3]

In this paper, we aim to explore and explain the rise in the number and magnitude of negative balance equity (NBE) cases in Ukraine over the last decade. We systematize existing approaches to interpret NBE and scrutinize the interrelation between zombie firms and firms with NBE. We use an original database of 212 big Ukrainian firms to study basic dynamics of the number, volume and longevity of NBE cases in 2006-2019. Our findings indicate that a sufficiently large share of Ukrainian NBE cases does not appear to fully adhere to any of the existing hypotheses, and their number and longevity tend to be abnormally high. We offer two possible explanations for such a phenomenon. The first is a quasi-risk financing model, based on substituting equity with debt financing from associated firms usually registered in tax heavens. The second one is a fraudulent financing model, based on the exploitation of legal and political backing discrepancy between debtor and creditor. The use of said models is indicated by positive operational cash flow in conjunction with the continued business activity of NBE firms that otherwise qualify for bankruptcy. We suggest the Value Gap Ratio as a rule of thumb indication of these financing models being used.
Keywords: corporate finance; capital structure; net equity; bankruptcy; zombie firms
JEL: G32; G33

Introduction

Ukrainian economy appears to be relatively unique. It bears a strong similarity to a colonial economy with its resources being slowly drained by an outsider group, its people's interests being safely ignored and its laws being rather selective in their application. Unlike a typical colonial economy, however, the outsider group in question is not foreign in its origins or enforcement. In fact, the majority of country's resources are owned by local elites, in a

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fashion, similar to other post-soviet states. This peculiarity is reflected in the quality and availability of financial statistics and in apparent distortions in the logic of economic relations underneath it. One of the prominent examples of such breaches of economic logic would be an abundance of firms with negative balance equity (NBE) among Ukrainian firms. To reiterate, the ever-increasing number of NBE firms in Ukraine in conjunction with their illogically prolonged existence was neither properly detected nor researched before.

It is not typical for firms to have NBE for a number of reasons. For one, negative equity is generally linked to the firm's poor performance and thus is often expected to be an indicator of financial distress. Firms with NBE rarely exist for prolonged periods of time due to the loss of their creditor's trust, which usually results in the bankruptcy procedure. In the case of Ukrainian firms, this is not backed by factual evidence, however, for even though the NBE firms indeed tend to show poor performance, they also tend to exist in this state for decades, including 5 or more consecutive years of NBE. A similar pattern can be observed for so-called zombie firms, which are fairly described by Ahearne and Shinada (2005) as "highly inefficient and debt-ridden" firms, that receive financial aid predominantly from related banks. Similarities between the two include industry, performance issues and receiving loans from related parties, but the most prominent difference appears to be that Ukrainian NBE firms sometimes do not appear to show signs of distress, such as halting of production or downsizing.

Modern corporate finance provides a number of plausible explanations for this, most notably the non-recurring shock hypothesis (Ang, 2010) or "veiled value" hypothesis (Fairchild, 2018). And while some of the precedents fall within the boundaries of these interpretations, others still remain unexplained. For instance, the majority of Ukrainian NBE firms simply do not have enough intangibles in order to create any "veiled value", for most of them are old-fashioned heavy industry plants with little to no R&D going on. Moreover, real estate re-evaluation tends to be done on a yearly basis by most of the Ukrainian firms, leaving out the possibility of unaccounted for value growth. The non-recurrent shock hypothesis, on the other hand, predicts short periods of NBE superseded by a relatively fast and consistent return to normal, non-negative values, with no apparent loss of the firm's profitability. In Ukrainian practice, however, it is not uncommon for firms to effectively disregard their NBE, which is further reinforced by the lack of a functional stock market. To summarize, Ukrainian firms tend to show similarities with zombie firms, firms hit by a non-recurring shock, and firms with undervalued assets often without tangible evidence of having suffered any of these conditions. To reiterate, even though some western researchers have discovered similar trends over the world, the question of the rise in the number of NBE firms remains largely unexplored, and the existing explanations do not seem to be fully applicable to Ukrainian cases.

The thesis of this article is that willingness of Ukrainian creditors to continue their support of firms with abnormally long periods of NBE is not irrational. We see it as an indication of usage of what we call "quasi-risk financing model", which appeared as a response to the unstable macro-financial and institutional environment in Ukraine along with low levels of property rights protection. The gist of this model is that owners prefer to finance their firms not by official increase of registered capital, but by using quasi-loans, which are given to Ukrainian firms by business entities, registered in tax heavens and tend to have the same

owner as of the Ukrainian firm in question. Such practice essentially means that these business owners are not using loans at all, and therefore any assessment of credit risk of such firms must account for that by considering such loans hidden equity.

Thus, in this research, we aim to explore the hike in the number and magnitude of NBE cases in Ukraine and provide explanations for the irregularities and breaches of economic logic we encounter.

The object of this study is the relation between the negative equity of a firm and its survival prospects. The subject of this study is a set of NBE firms within the Ukrainian economy.

The tasks of the study can be formulated as follows:

1) to review recent literature on negative equity and its occurrences worldwide, hypotheses on its origins and impact;
2) to formulate the methodological framework to research and sample selection;
3) to make an overview of NBE cases in the Ukrainian industry, using available data;
4) to provide a detailed account on the most interesting cases of negative equity discovered;
5) to explain whatever deviations from the common practice we will be able to locate.

Literature Review

NBE in and of itself is by no means a new or unheard of occurrence. For the most part, such firms are being excluded from the economic research due to the additional difficulties they bring into any sort of value calculations. Many ratios are simply not designed to use near-zero or negative balance equity, and firms with such parameters normally are indeed a small minority.

Moreover, having NBE contradicts one of the basic assumptions of corporate finance theory, namely the maximization of the owner's wealth as the main objective of any business activity. NBE indicates that the owner lost all previously invested capital, since amounts of creditors' claims exceed total assets book value. Under such circumstances, creditors would try to rescue their investment by initiating bankruptcy procedure. As a result, the insolvent debtor loses control over his assets, which then are managed or sold by the appropriate authorities in order to ensure fair distribution of losses among creditors according to local legislation. Furthermore, under the assumption of creditors' rationality, initiating a bankruptcy procedure immediately after being informed about delays in payments is within their best interest.

According to Mayers (1984), a rationally acting firm would try to mitigate or avoid excessive costs caused by financial distress. The magnitude of such costs is determined mainly by an excessive debt burden, for only the creditors can initiate bankruptcy. The higher the probability of bankruptcy is, the lower would be the market value of the firm reflected in its book-to-market ratio. This ratio is higher for more heavily leveraged firms, as shown by Garlappi, L. & Yan, H. (2011).

Current methods of assessing risk of bankruptcy are generally a variation upon Altman's Z-score model, which made bankruptcy predictions based on firm's ROA, cumulative profitability, stability of earnings, capitalization, debt service, liquidity, and size (see Altman, Haldeman, Narayanan, 1997). The modern takes on the model usually focus on altering the weight or composition of aforementioned factors in order to adjust for changing global conditions (for instance, Naresh Kumar and Sree Hari Rao, 2015). Having NBE usually reflects capitalization, stability of earnings and cumulative profitability well within the boundaries that indicate imminent bankruptcy.

Thus, historically, the most common explanation for NBE would be, how Ang (2010) has put it, "persistent losses hypothesis". This assumption explains negative equity with chronic underperformance by the firm in question, which results in losses big enough to exceed firm's shareholders' equity, reducing it beneath zero in the consecutive period. Persistent losses hypothesis can be inferred to be used as an explanation for NBE by many classical researches, which use book equity-based performance metrics (for instance, Fama and French, 1992) as well as by some of the more conservative new works (for instance, Urionabarrenetxea, San-Jose and Retolaza, 2016). It is consistent with the traditional approach, which views negative equity as a last stepping stone before bankruptcy.

However, the «persistent losses hypothesis» says nothing about NBE cases of excessive duration. Traditionally, the prolonged existence of firms under financial distress is explained by the financial support of banks. Sustaining vitality of dead firms is an old idea about the preference of tradeoff between labour and efficiency resolving in favour of the first. These financial practices were investigated by R. I. McKinnon (1991), who made an important conclusion that crediting non-viable firms leads to capital misallocation in the economy. In more recent studies, cases of excessive NBE periods duration got a good explanation within the concept of so-called "zombie firms". They were first recorded during the 1990s crisis in Japan, but since then widely accepted to be relatively common worldwide (see, for instance, Ahearne and Shinada, 2005 or Caballero, Hoshi and Kashyap, 2008). The number of such firms appears to grow with each economic downturn, and not to shrink accordingly after the crises (Banerjee, Hoffman 2018). The practices of rolling-over distressed firms' debts spread widely along with the 2008-2009 crisis. Papworth (2013) explained the Britain's "productivity problem" partially by zombie firms' holding up capital and labour in relatively unproductive sectors, raising the costs of entry for new, innovative firms. It should be pointed out that not all zombie firms have NBE. Urionabarrenetxea, San-Jose, Retolaza (2016), referred to Cabballero (2008), pointed out that NBE firms are the *"most extreme type of zombie companies"*.

More recent studies tend to conclude that NBE by itself is not an indicator of firm's lacklustre performance. For instance, Ang (2010) conducts a study of a wide selection of stock exchange-listed firms from 1962 to 2006 and concludes that not all of the firms which show NBE are in financial distress, which he defines as firm either failing to repay its obligations or being delisted due to corporate failure. Ang explains this with the "*non-recurring shock hypothesis",* which states that a number of non-recurring expenses and write-offs, suffered during specific activities like corporate restructuring or asset re-evaluations, could potentially drop book shareholders equity below zero without affecting production activity in any negative way. Therefore, the NBE firms that are not in financial distress are highly likely to

quickly regain positive book equity values. The non-recurring shock hypothesis assumes the NBE being covered by high returns in the future. We agree with Ang's (2015) conclusions that firms with NBE caused by a one-off negative shock should not have a high default risk or low survival rate. NBE does not necessarily mean an inability of financial recovering. The idea that firms with NBE are not financially distressed got a lot of empirical evidence. Mokrova and Zinecker (2016) empirical studies of manufacturing companies from the Czech Republic, Slovakia, Hungary, Poland and Germany for the 2006-2011 time period show that NBE is not a sign of a firm's bankruptcy or insolvency.

Fairchild (2018) reports, some of the better performing firms on the market (HP, McDonalds and Motorola, to name a few) appear to be content with NBE for prolonged periods of time. He explains it with firms having "veiled value" from undervalued intangible assets and real estate or lack of R&D capitalization. These firms are not risking the loss of their creditor's trust, and as long as they can reliably pay their current liabilities, they can afford to have negative book shareholders equity. Jan and Ou (2012) found NBE to result from accumulated R&D expenses over the years. This helps to explain NBE firms having a positive market value as also an ability to continue an activity for a long time. Some industries are more prone to such behaviour than the others – notably the ones with little need of tangible assets such as pharmaceutical or software companies, and as their number grew since the 1980s, so did the number of negative equity firms in general. Fraction of negative equity firms, listed on NYSE, AMEX and Nasdaq, reported by Ang (2010) for 1980-2006 was around 4%; he also states that there was little evidence of such firms before this period. A study of negative equity firms in Europe in 2009-2012, conducted by S. Urionabarrenetxea San-Jose and Retolaza (2016), concludes that the fraction of negative equity firms across Europe varies from 0 to 25% with an average of 6%. The fraction of negative equity PJSCs in Russia in 2009-2013 was reported by Grechenyuk, Grechenyuk and Sogacheva (2015) to be as high as 2.8% for PJSCs and 7.5% for PrJSCs. It is worth noting, that all these figures might not be directly comparable due to the differences in the selection and calculation methods, but all of them separately recognize the phenomenon of the growing number of NBE firms and its relative novelty. The latter means that such tendency is not covered by the more classic corporate finance researches written in the 1980s.

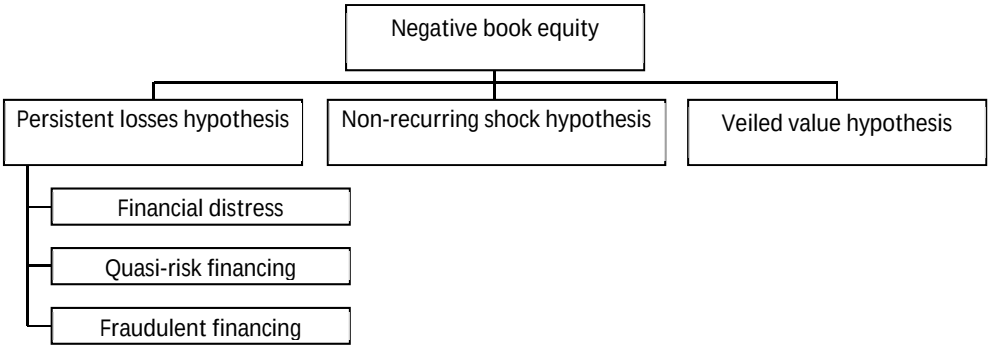
Researchers from the post-soviet countries appear to be less interested in the phenomenon of NBE than their western colleagues, even though this problem is more apparent for them. One of the main reasons for this is the aforementioned valuation complications, introduced by including NBE firms in the sample. Additionally, the very environment of a non-developed market introduces even more valuation problems. For instance, firms in post-soviet countries tend not to be traded on local stock exchanges, and hence feel no urge to maximize their stock worth by paying any dividends (Savchuk, Voloshchanyuk, Tereshchenko, 2019). This, incidentally, effectively excludes the dividend payouts as a likely reason of NBE for such firms. Local stock exchanges in post-soviet countries also tend to be effectively non-functional, providing no useful data on the market processes and housing little to no actual deals (Kerimov, 2019). The lack of need to maintain public image and virtually non-existent minor shareholders' property rights protection also allow for owner's income optimization strategies based on minimizing taxes by understating profits, which, in turn, tend to generate a sustained loss of equity capital over prolonged periods of time. Unsurprisingly, those researchers from post-soviet countries, who do mention NBE phenomenon, view it as an

exclusively negative occurrence and a sign of firm's total inaptitude or fraudulent nature (for instance, Abryutina, 2001, or Zemskov, 2008).

To summarize, there are currently three main approaches to interpret NBE. The persistent losses hypothesis explains NBE as a result of firm's chronic underperformance and views it strictly negatively. Non-western researchers tend to agree with such assessment, *making an emphasis on the high possibility of fraudulent nature of NBE firms,* due to the peculiarities of business practice in the post-soviet economies. The non-recurrent shock hypothesis views NBE as a neutral factor which is meaningless by itself and can occur in both prosperous and ruined firms, and therefore demands further investigation on an individual basis. The number of firms with NBE appears to be growing since the 1980s, and the firms, which naturally have less tangible equity, are more prone to having NBE. The veiled value hypothesis sees NBE as a result of failure on the part of modern accounting methods to accurately capitalize R&D and marketing expenses (Figure 1).

Figure 1

Causes for negative book equity



Source: author's generalization based on Ang (2015), Fairchild (2018), Jan and Ou (2012) and Zymovets (2019).

We add quasi-risk and fraudulent financing models as specific instances of persistent losses hypothesis. Unlike the original assumption used by Ang 2015, we believe that in some cases, the losses suffered by a firm are intentional and serve to avoid taxation, to minimize possible losses in case of a hostile takeover or to exploit vulnerable creditors.

The macro-financial consequences of the increasing number of NBE firms appear to be out of focus of the recent NBE studies. The impact of zombie firms, however, garners much more attention. Following Ahearne and Shinada's (2005) conclusions about the negative effects of higher zombie firms' concentrations on productivity growth, we can assume that increase of NBE firms' number has similar results. Caballero, Hoshi, and Kashyap (2008) showed zombies to crowd the market and that such congestion affects the healthy firms negatively. They predicted the prevalence of zombie firms to depress total productivity, since inefficient firms are preserved at the expense of potentially more productive newcomers.

While receiving financial resources directly from associated financial or non-financial entity might seem harmless, it has wider implications. Capital misallocation, caused by such practices, facilitates the "freezing" of valuable resources in the hands of businesses that are incapable of using them to their full potential. It is a consequence of all forms of sustaining non-viable firms, including NBE or zombie firms, which otherwise would fall to Schumpeter's creative destruction. If banks or other financial intermediaries engage in such practice, this appears to undermine R. Levine's (2004) idea of the positive impact of financial development on economic growth, specifically the assumption about more optimal allocation of financial resources via the financial sector.

Nevertheless, different cases of NBE have similar consequences for a financial system and economy as a whole. On the aggregate level, an increase of NBE firm's number results in the decline of the total equity of non-financial corporations, causing a debt burden on the sectoral level and upping systematic risk. NBE firms' proliferation negatively affects financial markets due to a decrease in the number of creditworthy borrowers, thus restraining capital reallocation and slowing economic growth. Therefore, the question of NBE firms is growing more significant, which calls for a solid classification of such cases. It stands to reason that a firm that has NBE due to an accounting quirk requires a vastly different approach in appraising and regulating than a firm, which uses underreporting its earnings for tax avoidance.

Methodology and Data

The usual practice is to assume NBE firms' recovery or liquidation within the normal period of up to three years. We assume that NBE cases, induced by financial distresses and one-off shocks, would indeed finalize over this normal period. Cases of NBE duration exceeding normal period, however, are considered to be a manifestation of foul play due to creditors' reluctance to withdraw debts. This reluctance may be intentional or forced.

Intentional reluctance to withdraw debts indicates the use of the *quasi-risk financing model* when creditors are associated with the firm's owners. It is a relatively common practice in Ukraine, when business owners withdraw cash from their firm registered in Ukraine as expenditures towards another of their firms registered off-shore, and then return said cash as quasi-loans from one of their off-shore firms. Usually, firms manage cash withdrawal using the tax avoidance procedures like causing artificial losses and liquidity gap covered by quasi-loans inflows from off-shore facilities and shadow economy (money laundering). Thus, in such a financing model, some debts are not real liabilities, but rather quasi-loans from related parties. We consider such quasi-loans to be hidden capital. Choice of the quasi-risk model may be forced by the poor institutional environment with weak protection of property rights. Using it allows to secure firm's assets against a hostile takeover by raiders as was pointed by Zwiebel (1996). The quasi-risk financing model echoes with the pecking-order theory's assumption about the avoidance of external sources of funding. Such form of business financing is typical for Ukraine and often includes the creation of artificial debts before associated companies (mainly registered off-shore) or other tax avoidance vehicles, as shown by Zymovets (2019). Such tax avoidance vehicles often take a form of a private joint-stock

company with little to no registered capital, no actual production or personnel, which officially buy and re-sell products from their affiliate creator firms, often at non-market prices. In this case, nothing restricts the duration of the NBE period until a firm's cash flow is enough to meet its obligations.

Forced reluctance to withdraw debts is often the case in a situation when a bigger firm refuses to pay off its accounts payable. It is mostly possible due to major discrepancies in legal position and political backing between debtor and creditor, which makes the debtor practically unable to initiate and manage bankruptcy proceedings against an insolvent NBE firm with better political and legal backing. In this case, we can conclude that the debtor firm uses a *fraudulent financing model*. The use of this model helps business owners to extract capital from weaker creditors, which are usually small and medium firms whose claims to the debtor are often less than the court costs would be, while their expected debt recovery rate is only around 9%, as opposed to 70,2% in OECD high-income countries, as is shown by World Bank's statistics. Final beneficiaries in the case often are owners of big enterprises, so-called «oligarchs». Their ability not to pay off debts allows them to manage the business with no equity at all. In the high inflation environment, the benefits of using such a model for the debtor are amplified by the fact that accounts payable do not involve any contractually fixed interest payments, while their value decreases drastically over time.

We chose to study NBE on Ukrainian data because we believe that some peculiarities (like tax-avoidance or controlled bankruptcies) are more pronounced in Ukraine due to more overt symbiosis between business, law-making, and law enforcement. It will hopefully allow us to fill the grey area of non-bona-fide instances of NBE and to produce tell-tale signs of such foul play.

For our research, we have gathered a small database of 212 Ukrainian firms. All of our data originates from open sources, such as the Stock Market Infrastructure Development Agency of Ukraine official website (smida.gov.ua), the sites of individual firms of the sample and a number of websites that aggregate open data on Ukrainian entities (youcontrol.com; opendatabot.com). The data on bankruptcy cases, which we included in this paper, was taken from the Unified State Court Decisions Registry (reyestr.court.gov.ua) on an individual case basis.

Information from periods before 2006 and after 2019 is not included due to its inconsistent availability. All the data is indicated for the beginning of the year. More details on our sample can be seen from Table 1.

Industries in the sample are grouped using the national Classification for Types of Economic Activities, which is a rough equivalent to ISIC Rev.4 classification used by, for instance, OECD statistics. The sample, as a whole, accounts for 16.8% of total aggregated revenue and 17.3% of total aggregated assets in the Ukrainian economy for the period. It is the most complete coverage one can reasonably achieve by using open-source data. Sample composition also indicates rather high levels of concentration of Ukrainian industry, most notably the coke and refined petroleum industry where 9 firms account for 73% of industry's revenue and 68% of industry's assets. Thus, any conclusions reached for a sub-sample with more than 20% of revenue and/or assets would be indicative for the corresponding Ukrainian industry.

Table 1

Ukrainian industrial enterprises sample parameters

Industry	ISIC Rev 4 Code	Number of firms in the sample	Portion of total industry revenue, covered by the sample, %	Portion of total industry assets, covered in the sample, %
Crop and animal production, hunting and related service activities	A01	17	31.59	20.83
Mining and quarrying	B	14	57.31	50.21
Food products manufacturing	C10	44	21.18	19.46
Coke and refined petroleum products manufacturing	C19	9	73.05	68.72
Chemicals and chemical products manufacturing	C20	9	41.39	37.05
Basic metals manufacturing	C24	15	76.83	37.05
Machinery and equipment manufacturing, including transport manufacturing	C26-30	41	30.98	36.28
Electricity, gas, steam and air conditioning supply	D35	16	55.64	56.92
Construction	F	24	4.71	4.53
Wholesale and retail trade, repair of motor vehicles and motorcycles	G	23	54.19	17.94
Total	-	212	-	-

Source: authors' calculations.

Portions of total industrial revenue and assets, shown in Table 1, are arithmetic means of corresponding portions, calculated for the 2013-2016 time period. The 2013-2016 time period for average values is chosen due to the availability of aggregated data, provided by the State Statistics Service of Ukraine in their "Activity of business entities" annual statistical publication. Since the Statistics Service constantly amends the structure of said publication, it is nigh impossible to form a consistent aggregated data time series.

To assess the scale and dynamics of the NBE in Ukraine, we calculate ratios using the data of NBE volumes on the firm level, number of NBE firms and compare obtained results with empirical observations of our predecessors. The study is built as follows.

1. We calculate the fraction of NBE firms in the sample and compare it to the percentage of NBE firms taken from other empirical studies. According to Ang (2015), about 4% of firms listed on NYSE/AMEX/Nasdaq have been reporting NBE since 1985. As pointed by Brown et al. (2008), the number of stocks with NBE increased to approximately 5% of all listed stocks since the late 1980s. Urionabarrenetxea, San-Jose, Retolaza (2016) estimated the average percentage of firms with NBE at 6% of their total number. We assume those rates are close to the «normal» NBE rate and exceeding it indicates the use of a quasi-risk or fraudulent financing model. We also check whether our NBE cases show signs of being zombie firms. For this, we define zombie firms as firms having three consecutive years of less-than-one interest coverage ratio (same as Banerjee and Hofmann, 2018). This allows us to obtain the percentage of NBE firms that have financial distress as zombie firms. Further comparison of the total NBE firms' number per industry

with the number of bankruptcies and number of zombie firms allows us to check the assumption about the use of quasi-risk or fraudulent financing.

2. We calculate the value gap ratio (VGR_A) on the aggregate sample level as total assets (A) divided on total liabilities (L) subtracted from 1.

$$VGR_A = (1 - A / L)$$

L – total assets of the sample

A – total liabilities of the sample

The ratio shows the percentage of liabilities not covered by assets at the level of the aggregate sample. An abnormal increase of VGR may be a sign of the quasi-risk/fraudulent financing spreading, which would require further study of VGR at the firm level confirm. On the firm level, we calculate the VGR_F ratio that shows creditors' percentage losses compared to their total claims.

$$VGR_F = (1 - A_{NBE}/L_{NBE})$$

L_{NBE} – liabilities of firms reporting NBE;

A_{NBE} – assets of firm reporting NBE.

We compare the median of VGR on the firm-level with empirical results by Ang (2015) about the median BE/TA (balance equity to total assets ratio) transforming BE/TA into VGR as following:

$$VGR = 1 - 1/(1+BE/TA)$$

We presume that an abnormally high level of VGR may be a sign of an intentional substitution of equity by debts, i.e. of usage of quasi-risk or fraudulent financing model.

3. To identify atypical NBE cases of quasi-risk/fraudulent financing, we calculate the NBE durations on the firm level to compare with normal duration taken from Ang (2005) about the median NBE duration up to 3 years. If NBE duration exceeds this period, it may be an indication of quasi-risk or fraudulent financing model usage. We investigate whether bankruptcy proceedings were initiated against firms with an NBE duration of more than three years. Non-initiating of bankruptcy procedures confirms the use of a quasi-risk/fraudulent financing model.

Finally, we develop on the practical guidance to identify the abnormally high NBE levels, using deviations of actual NBE metrics from those, taken from empirical observations of previous papers about the subject.

4. In order to support our hypothesis of usage of quasi-risk/fraudulent financing models, we investigate the financial performance of NBE firms. For this purpose, we divide NBE firms into two groups: those that had NBE and went bankrupt and those that had NBE for 3 and more years, yet retained their operational activity. We include the results achieved by Altman, Haldeman, Narayanan (1977) as a general benchmark, but we only calculate some of the key indicators, for accessing the risk of bankruptcy among our sampled firms would be entirely different research. Namely, we include such indices: EBIT/TA

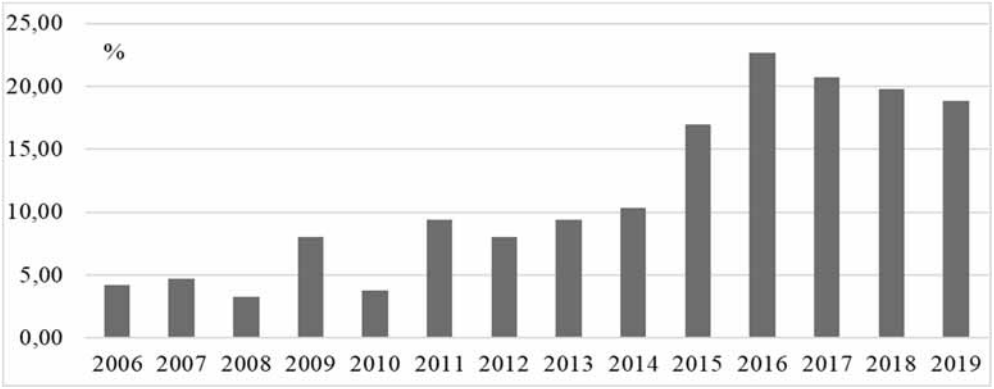
(Earnings Before Interest and Taxes/Total Assets, benchmark value – below -0,00555 for bankruptcy-prone firms), RE/TA (Retained Earnings/Total Assets, benchmark value – below -0,00066 for bankruptcy-prone firms), CF/TD (Cashflow/Total Debt, benchmark value – below -0,0173 for bankruptcy-prone firms) and NS/TA (Net Sales/Total Assets (1,312). Additionally, in order to illustrate the common practice of debt-paying among Ukrainian industrial firms, we provide average values of Days Payables Outstanding (benchmark – 60 days, after which it is legally possible to initiate bankruptcy) among the NBE firms. We expect that non-failed NBE firms should have better financials than bankrupted firms with NBE, and that both of them would have a legitimate cause to be proclaimed bankrupt. The continued existence of such firms we see as proof of their use of quasi-risk or fraudulent financing models.

Results

To assess the general dynamic of NBE firms' quantity, we calculate the fraction of them in the sample. We found the fraction having increased drastically over 2006-2019 from 4.3% to 18.9%, as can be seen from Figure 2. Up to 2010, the fraction was lower than 5% except for climbing in 2009 because of the financial crisis impact.

Figure 2

NBE firms' fraction in the sample over 2006-2019



Source: financial reports of Ukrainian firms, www.smida.gov.ua.

Over 2010-2016, the actual NBE firms' fraction increased up to 22.6% that is substantially above its conditionally normal rate of 5%. The climbing of NBE firms' fractions may reflect the wider use of quasi-risk/fraudulent financing since 2010. In the meantime, we also do not exclude the impact of the financial crisis and other external shocks on the NBE firms' fraction increase. The yearly distribution of the NBE cases frequency shows their massive increase in 2014, which coincides with the beginning of the war with Russia. The majority of firms that got NBE in that period were the machinery producing firms that depended on Russian-made materials and the Russian market and had to re-establish their production chains according to the new situation (for details, see Annex 1). There was a much smaller hike in a number

of NBE firms after the economic crisis of 2008, caused by the plummeting of hryvna exchange rate and the discrepancy between the firm's income in hryvna and their debt payments in foreign currency. Most of the firms affected by it appear to be in trade, energy supply or food production – all of which depend heavily on imported materials and used borrowed money to acquire them. Hike in negative equity after 2011 mostly affected metallurgy and chemical products manufacturing, which is likely to be attributed to price changes on the global market. Trade, construction, mining and agricultural industries appear to consistently have NBE firms regardless of circumstances, i.e. zombie firms likely supported by quasi-risk financing.

To check the assumption about the spreading of quasi-risk financing, we compare the fraction of NBE firms in the sample to the fractions of bankruptcy cases and zombie firms in NBE firms (Table 2). A lower fraction of bankruptcies and a higher percentage of firms, classified as zombies, point to the usage of quasi-risk/fraudulent financing models. A zombie firm with NBE can only be viable due to external financial support from related banks.

Table 2

Fraction of NBE and bankrupted firms in the sample per industry, 2006-2019, %

Industry	NBE firms' fraction	Bankrupted firms' fraction	Zombie firms' fraction
Crop and animal production, hunting and related service activities	23.5	-	75.0
Mining and quarrying	21.4	-	33.3
Food products manufacturing	27.3	8.3	75.0
Coke and refined petroleum products manufacturing	33.3	-	66.7
Chemicals and chemical products manufacturing	66.7	-	100.0
Basic metals manufacturing	53.3	20.0	100.0
Machinery and equipment manufacturing, including transport manufacturing	34.2	28.9	71.4
Electricity, gas, steam and air conditioning supply	22.2	-	60.0
Construction	37.5	8.3	50.0
Wholesale and retail trade, repair of motor vehicles and motorcycles	39.1	25.0	66.7
Total NBE	34.9	16.2	71.6
Total sample	34.9	8.0	42.0

Source: authors' calculations.

As shown in Table 2, over 2006-2019, the fraction of NBE firms in the sample was 34.9%, which is considerably higher than the conditionally normal level of 5%. No industry has a percentage of NBE firms lower than 20%. It may point to the use of quasi-risk/fraudulent financing models over all industries. A substantially higher percentage of NBE firms was in the highly concentrated chemical industry (66.7%) and basic metals manufacturing (53.3%). The mining and quarrying industry, on the other hand, which is the third most concentrated industry in the sample, has the less NBE firms. We also observe a slightly higher than average percentage of NBE firms in less concentrated construction and trade. Therefore, there appears to be no clear relation between the level of concentration of industry and the fraction of NBE firms, even though it might have something to do with other attributes of the firms in question, for instance, their size.

The logical outcome of the poor performance of a firm is bankruptcy. Despite the high fraction of NBE firms in our sample, there aren't many actual bankruptcies, and the majority of them have been initiated only recently. Of the total number of NBE firms, only 8% underwent bankruptcy. It can mean that creditors were not willing to initiate bankruptcy procedures because of the many reasons inherent with quasi-risk methods of business financing. Being a zombie firm appears to be more closely related to the possibility of bankruptcy, with 82% of bankruptcy cases concerning such firms, although the latter could be the result of a much higher number of zombie firms in the sample. This may also mean that zombie firms in question have true liabilities, unlike other NBE firms that didn't undergo bankruptcy.

The small number of bankruptcies allows us to explore them on the case to case basis. Annexe 2 includes all of the bankruptcies in the sample, initiated from 2006 to 2020. The observed data makes it obvious that the absolute majority of firms that went bankrupt were subsidiaries of larger holdings, or, more precisely, financial-industrial groups (FIG). These huge conglomerates are often loosely connected and owned by a few or a single owner via a number of holdings registered off-shore (notably in Cyprus). As a general rule, such owners would-be oligarchs and members of Ukrainian parliament.

Half of the bankruptcies are not concluded, most of which are newly initiated. This allows to highlight the fact that the bankruptcy procedure in Ukraine lasts on average longer than a year. In such cases like Kreatyv PrJSC, Pervomayski MCC PrJSC, AvtoKRAZ PrJSC and Kvazar PJSC – much longer than a year. All of these cases included multiple appeals to cancel the bankruptcy procedure, which allowed to lengthen the corresponding procedures for multiple years. Around 1/3 of bankruptcy cases do not record NBE whatsoever. Most of such cases are swiftly concluded. Cases with NBE, record 5 years of NBE on average.

It is also worth noting, that around 30% of bankruptcy cases were initiated by a minor creditor with debt less than UAH 10 mln. This is unusual for the Ukrainian environment since the minor creditors that do not have a backing of a FIG would have been forced to withdraw their applications by the bigger creditors. This is mostly due to the low bankruptcy repayment rate (around 10%) and the fact that bigger creditors potentially lose much more than the smaller ones. This rule is broken, however, in the event of a hostile takeover or guided bankruptcy. For instance, a typical scheme used for a takeover in the sampled bankruptcies includes using an affiliated minor creditor to buy out debt from a minor creditor of a target firm and then immediately initiate bankruptcy procedure. Sometimes the procedure can be enhanced with bribing the target firm's management into wide cooperation and/or reinstating loyal managers via court. The latter is made possible by the peculiarities of the Ukrainian judiciary system.

Guided bankruptcies include deliberate misrepresentation of firm's financials by relocating parent firm's profitable activities to an often newly-created affiliated firm by "selling" its goods at unreasonably low prices or even giving goods away on the pretext of paying off similarly artificial debts for services. Thus, it is relatively safe to conclude that any judiciary active Ukrainian small firm is likely to be affiliated with one or bigger participants of the trial.

The study of bankruptcy cases shows that only about 8% of NBE firms went bankrupt over the regarded period. It means a majority of NBE firms managed to escape bankruptcy

procedures. While accessing the risk of bankruptcy of the sampled firms is not the focus of our research, our findings suggest that the percent of bankruptcies in the sample should be higher. The number of zombie firms indicates that 42% of sampled firms struggle with paying off debts for three or more consecutive years. Having prolonged periods of NBE for sampled firms indicates low returns on assets and inadequate cumulative profitability, and even without further calculation, it is clear that firms that are both zombie firms and have prolonged periods of NBE (of which there are 24.9% of the sample) would have a dangerously low Z-score and would likely to be considered bankrupt.

And while few NBE firms underwent bankruptcy, the majority of them (71.6%) show signs of being zombie firms (Table 2). The high fraction of zombie firms reflects the unwillingness by banks to initiate bankruptcy and liquidation procedures for NBE firms. Among many possible reasons for such seemingly irrational behaviour, we think that in the case of Ukraine, the most likely one is collusion between banks and borrowers. It is when banks and NBE firms shareowners, such financing schemes become not only possible, but usual. The unusually high percentage of zombie firms in an industry might coincide with higher levels of political and legal support for the firms that represent that industry.

To assess the overall spread of zombie firms, we calculated the fraction of them in the sample. Judging from the available statistics, one could conclude that Ukraine potentially has an above-average level of zombie firms per industry, for the normal share of such firms in 14 advanced economies, as reported by Banerjee and Hofmann (2018), was 12% in 2016. The average share of zombie firms across the main sample is almost 42%. Unlike these researchers, however, we disregarded the condition of the firm being over 10 years old due to local specifics. The absolute majority of zombie firms in the sample were registered in the late 1990s and at the beginning of 2000s, and at the most part, they were created by re-organizing former state enterprises. Therefore, even if they were not exactly 10 years old by the time they had their three consecutive years of less-than-one interest coverage ratio, they could hardly be considered "new" firms. The difference between shares of zombie firms may indicate the more widespread use of the quasi-risk financing model in Ukraine.

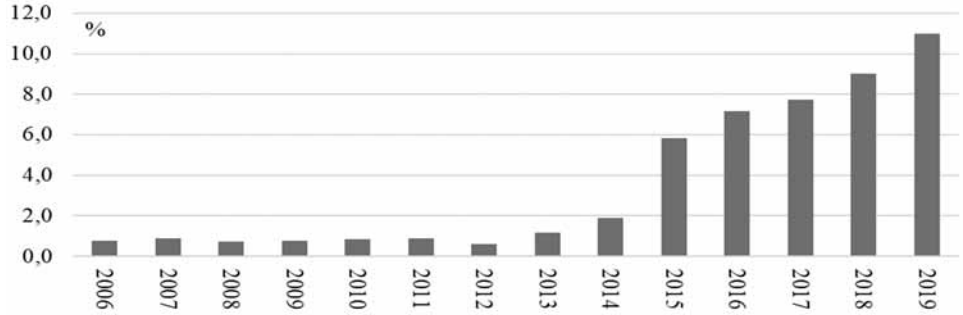
The increase of NBE firms' number impacts the financial system negatively because of upping the risks measured with the value gap ratio (VGR_A). As shown in Figure 3 up to 2014, the VGR_A was below 2%. It means that less than 2% of the total liabilities of the sample were not covered by assets. In further years, the VGR_A skyrocketed up to 11% at the beginning of 2019. We assume that if we are to include the SME's financial data, the VGR_A would be even higher due to the chronically worse financial performance of SMEs, as was pointed by Zymovets (2019).

To examine the NBE spreading inside the sample, we calculated VGR on the firm level (Annex 3). The breakdown of VGR into quartiles shows the increase in all of them. Over the whole period, the median VGR increased from 19 to 45%, surging after 2014. Over 2015-2019, the median VGR of the sample of 35.16% appears substantially higher than the conditionally normal VGR calculated from NE/BA data in Ang (2015) of 21.9%. We recognize the drop of equity below zero for many firms as a consequence of the sharp hryvna's depreciation over 2014-2016 set in motion by the annexation of Crimea and subsequent seizure of assets in both Crimea and Donbas by Russia. The abnormally high level of VGR may be a result of the reappreciation of debts to related parties, including banks,

nominated in foreign currencies. Therefore, the surge of VGR reflects the impact of worsening macro-financial conditions and the widespread use of the quasi-risk financing model on Ukrainian firms.

Figure 3

Value Gap Ratio (VGR), an average of sample of 212 Ukrainian firms



Source: Data of financial reports of 212 Ukrainian firms, www.smida.gov.ua.

Along with abnormally high VGR, the prolonged NBE duration also points to the use of quasi-risk and fraudulent financing models. To sort the NBE cases in line with typical ones, we calculated the actual NBE duration for every firm in the sample. We compared the results with the findings of Ang (2005) about median NBE duration up to 3 years. The exceeding of this period may mean the use of quasi-risk financing.

Table 3

Sample firms' NBE periods duration

Duration, years	NBE		Bankruptcy/termination	
	Cases	Fraction of main sample, %	Cases	Fraction of NBE cases , %
Total NBE	74	35	13	18
1 - 3 year	33	16	5	15
over 3 years	41	19	8	20

Source: financial reports and legal data of 212 Ukrainian firms over 2006-2019.

It is worth noting that almost 20% of the sample show prolonged periods of NBE, with relatively few of them (15%) ever facing the bankruptcy procedure. Moreover, the bankruptcy cases captured in the sample generally have one or more signs of fraudulent elements like abnormally long or short procedure duration, atypical initiating parties or collusions between debtors and creditors. NBE appears to be a minor factor in the bankruptcies of the sample's firms.

Due to the quality of available data (specifically, abundance of periods when some of the firms of the sample did not provide their financial statements), it is likely the number of NBE periods is higher as is their median longevity. With the amount of NBE firms being abnormally high as is, it indicates strongly towards our hypothesis that there are specific quasi-risk and fraudulent models of financing used by Ukrainian firms.

Table 4

Select financials for NBE firms, 2006-2019

	EBIT/TA	RE/TA	CF/TD	Days Payables Outstanding	NS/TA
Benchmark	-0,00555	-0,00066	-0,0173	60	1,312
Bankrupted NBE firms					
1q	-0,19093	-1,33152	-0,00102	18710,1	0,005
2q	-0,07536	-1,03968	0,00440	132,4	0,190
3q	0,00000	-0,70433	0,02611	31,1	1,420
4q	0,09659	-0,44410	0,10447	5,1	2,005
Firms with 3 or more years of NBE					
1q	-0,05311	-1,19914	-0,02109	3223,3	0,322
2q	0,00391	-0,69985	0,01192	199,6	0,849
3q	0,03772	-0,29947	0,03808	76,6	1,321
4q	0,44793	-0,05322	0,83187	20,9	20,430

Source: financial reports and legal data of 74 NBE firms over 2006-2019.

As can be seen from Table 4, the average financials of bankrupted NBE firms are indeed worse than those of non-bankrupted NBE firms, mostly due to the worst cases weighting them down considerably. However, even the non-bankrupt NBE firms show an immense delay in repaying their debts (3 or more times the limit that allows creditors to initiate bankruptcy), and thus their continued existence could only indicate that their creditors are somehow content with such a state of affairs. Moreover, both bankrupted and non-bankrupted NBE firms show clearly worse RE/TA ratio than the bankrupted firms in the sample provided by Altman, Haldeman and Narayanan (1977), which indicates that in normal circumstances, all of them would be considered prone to bankruptcy. However, slightly positive median EBIT/TA of NBE firms that did not undergo bankruptcy procedure in conjunction with their above-zero median CF/TD imply that most of these firms have enough cash flow to continue the operational activity. This supports our hypothesis of Ukrainian NBE firms surviving due to the usage of quasi-risk or fraudulent financing models.

Conclusions

The fraction of NBE firms in Ukraine demonstrates a fast increase over 2006-2019 up to 18%, which is substantially higher than its conditionally normal level of 5%. This exacerbates financial risks due to an increase in value gap ratio (VGR) calculated as the percentage of creditors' claims not covered by available assets. The abnormally high VGR on the firm level in Ukraine appears to be a strong argument for the quasi-risk financing spreading over the last decade, i.e. business financing through quasi-loans granted by related parties, including ones registered off-shore. The other model, which we define as a fraudulent financing model, is used to extract capital from the weaker creditors by exploiting their lack of legal and institutional backing. Both of the models are actively used in tax avoidance. Since the majority of big industrial enterprises, if not all of them, are both owned by oligarchs via their vastly profitable financial-industrial groups and have continued functioning in NBE-state for years, it is quite likely that their losses are deliberate. Such state may be used in order to optimize taxation (i.e. avoid paying taxes in Ukraine) while using enterprises' protected state

(for most of them are unique providers of their goods in Ukraine) to continue generating profits, that are redirected to tax heavens via a number of schemes, like lending by captive institutions.

Generally, the quasi-risk and fraudulent financing models should be considered within the frame of two existing approaches – the «persistent losses hypothesis» (although remarking that the losses are deliberately created) and the concept of zombie firms. External shocks (war with Russia and related capital outflows) seem to exacerbate the NBE volumes because of substantial debts outstanding, nominated in foreign currency, on the background hryvnia depreciation. Therefore, we can relatively safely assume that the number of NBE firms partly may result from external shocks.

The assumption about the quasi-risk/fraudulent financing model usage is further confirmed by the abnormally long NBE periods observed across Ukrainian firms suggesting the strange vitality of them. The average length of the consecutive NBE period of the enterprises of the sample is 4 years and more, up to 12 consecutive years. The NBE firms have the ability to survive for long periods because of the creditors' reluctance to initiate bankruptcy procedures. Bankruptcy procedures were initiated only against 20% of firms having an NBE duration of more than three years. Moreover, with a decent probability, we can conclude that most of the bankruptcies analyzed were not driven by the firm's bad performance, but by other motives, most of which were connected to abusing bankruptcy procedure in order to write off debts, establish control over the firm or to deny another party a possibility to acquire the firm.

Based on the research made, it is possible to formulate the following hypothesis. A weak institutional environment and high systematic risks push businesses in Ukraine to find safer than traditional models of financing. Therefore, businesses choose the quasi-risk financing model in which their deliberate losses create abnormally long periods of NBE. The lack of equity is substituted with B2B lending from related parties. The manifestation of this phenomenon is the abnormally high duration of the non-financial current liabilities turnover period allowing to maintain the positive cash flow of the firm for a long time. Unless creditors seek redemption they are considered to be related parties with full direct or shadow control over the firm. At the same time, fraudulent financing model have spread, which is based on non-return of funds to weaker counterparties. This hypothesis is likely to be universally applicable.

We believe that the NBE cases highlighted in this article are not unique for Ukraine or countries with weaker institutions or legal environment. And while the fraudulent financing model is hard to use in countries with a developed legal environment, the quasi-risk financing model is used to an extent by most of the multinational corporations for tax avoidance. And while the Ukraine's example shows more crude and obvious patterns of such behaviour, the framework used to explore it is potentially useful for other countries.

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Annex 1

NBE firms' frequency (percentage of total number) across industries

Industry	Section	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Crop and animal production, hunting and related service activities	A01	0.0	0.0	0.0	0.0	0.0	11.8	11.8	5.9	5.9	11.8	17.7	11.8	11.8	11.8
Mining and quarrying	B	0.1	7.1	7.1	7.1	7.1	7.1	0.0	0.0	0.0	0.0	7.1	7.1	0.0	0.0
Food products manufacturing	C10	0.0	2.3	0.0	6.8	2.3	6.8	4.6	4.6	0.0	6.8	18.2	20.5	15.9	15.9
Coke and refined petroleum products manufacturing	C19	0.0	0.0	0.0	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	22.2	33.3
Chemicals and chemical products manufacturing	C20	0.0	0.0	0.0	0.0	0.0	22.2	22.2	33.3	55.6	55.6	66.7	66.7	66.7	66.7
Basic metals manufacturing	C24	13.3	0.0	0.0	0.0	0.0	0.0	13.3	20.0	26.7	40.0	46.7	33.3	40.0	26.7
Machinery and equipment manufacturing, including transport manufacturing	C26-30	0.0	2.4	0.0	2.4	4.9	7.3	4.9	7.3	7.3	17.1	24.4	26.8	22.0	22.0
Electricity, gas, steam and air conditioning supply	D35	18.8	18.8	25.0	25.0	6.3	6.3	0.0	0.0	0.0	0.0	6.3	6.3	6.3	6.3
Construction	F	0.0	8.3	8.3	8.3	4.2	12.5	8.3	8.3	16.7	20.8	16.7	20.8	20.8	20.8
Wholesale and retail trade, repair of motor vehicles and motorcycles	G	4.4	8.7	0.0	21.7	4.4	17.4	17.4	21.7	17.4	30.4	30.4	13.0	17.4	13.0
Total sample		4.3	4.7	3.3	8.0	3.8	9.4	8.0	9.4	10.4	17.0	22.6	20.8	19.8	18.9

Data from the firms' financial statements at the beginning of the year. Database available from: https://drive.google.com/file/d/1A92fHlbty5I9OslYkc7Szx8RCciPxljj/view?usp=sharing

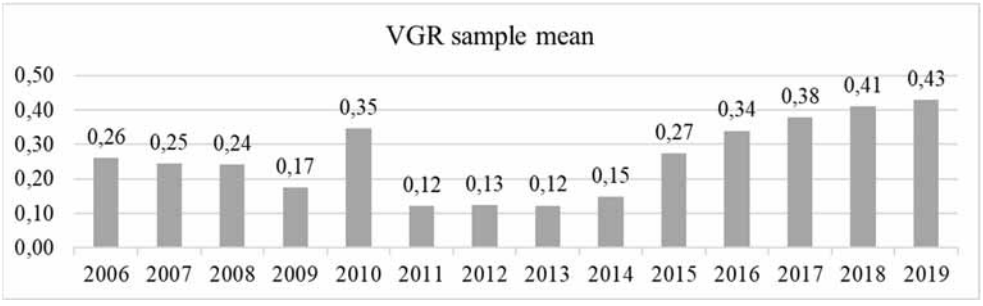
Annex 2

Bankruptcies in the sample

№	Name	ISIC	Affiliation with FIG	Negative equity periods	Case initiated	Initiator	Case concluded
1	PrJSC Kreatyv	C10	Yes	2015-2018	06.06.2016	Self-initiated	16.04.2018
2	PrJSC "Pervomayskiy MCC"	C10	Yes	-	12.07.2016	Creditor	In progress
3	PrJSC “Rosava”	C19	Yes	-	15.11.2018	Self-initiated	04.12.2018
4	PJSC DMK	C24	Yes	2012-2018	31.05.2019	Minor Creditor	In progress
5	PrJSC YENAKIIEVE STEEL	C24	Yes	2018	01.07.2019	Minor Creditor	In progress
6	PJSC Cominmet	C25	Yes	2012-2016	05.09.2017	Self-initiated	26.09.2017
7	PrJSC AutoKRAZ	C26-30	Yes	-	24.09.2018	Creditor	In progress
8	PrJSC ZTR	C26-30	Yes	2015-2018	17.10.2019	Self-initiated	In progress
9	PJSC “Druzhkivka Machine-building plant”	C26-30	Yes	-	17.12.2019	Creditor	17.12.2019
10	PJSC Kvazar	C26-30	Yes	2016-2018	06.03.2019	Creditor	In progress
11	PJSC Borex	C26-30	No	-	25.09.2018	Self-initiated	02.10.2018
12	PJSC SumyKhimProm	C26-30	No	2010-2018	24.10.2011	Creditor	30.10.2012
13	PJSC KHSP	C26-30	Yes	2015-2018	04.08.2014	Minor Creditor	19.08.2016
14	PJSC Trust Kyivmiskbud-3	F	No	2017-2018	26.06.2019	Creditor	In progress
15	PrSC HBC №3	F	No	2018	31.07.2019	Creditor	In progress
16	LLC Evrotek RC	G	Yes	2013-2016	31.01.2019	Minor Creditor	20.06.2019
17	PrSC Carlo Pazolini Trading	G	No	2009-2016	07.07.2016	Minor creditor	25.10.2016

Annex 3

Value Gap Ratio (VGR) on the firm level of the main sample (212 firms)



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mean	0.26	0.25	0.24	0.17	0.35	0.12	0.13	0.12	0.15	0.27	0.34	0.38	0.41	0.43
1q	0.08	0.10	0.06	0.09	0.12	0.02	0.07	0.05	0.04	0.11	0.17	0.16	0.21	0.20
2q	0.19	0.14	0.10	0.10	0.20	0.10	0.12	0.11	0.10	0.27	0.33	0.34	0.39	0.45
3q	0.41	0.31	0.31	0.16	0.36	0.18	0.18	0.19	0.25	0.38	0.51	0.54	0.57	0.64
4q	0.63	0.63	0.81	0.84	1.00	0.35	0.29	0.28	0.46	0.74	0.93	0.89	0.91	0.91