BOFIT Discussion Papers
30 • 2015

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Bank of Finland, BOFIT
Institute for Economies in Transition

BOFIT Discussion Papers
Editor-in-Chief Laura Solanko

BOFIT Discussion Papers 30/2015
30.10.2015

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ISBN 978-952-323-070-5
ISSN 1456-5889 (online)

Suomen Pankki
Helsinki 2015

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Abstract

In this paper, we explore a relation between expected returns and idiosyncratic risk. As in many emerging markets, investors in the Russian stock market cannot fully diversify their portfolios due to transaction costs, information gathering and processing costs, and shortcomings in investor protection. This implies that investors demand a premium for idiosyncratic risk – unique asset-specific risk plays a role in investment decisions. We estimate the price of idiosyncratic risk using MIDAS regressions and a cross-section of Russian industry portfolios. We find that idiosyncratic risk commands an economically and statistically significant risk premium. The results remain unaffected after controlling for global pricing factors and short-term return reversal.

Keywords: idiosyncratic risk, industry risk, cross-sectional returns, MIDAS, Russia
JEL classification: G12

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The authors thank Laura Solanko, Gregory Moore, and seminar participants at the BOFIT Research Seminar, Helsinki, Finland, December 2014, for their helpful comments and suggestions. Part of this research was carried out while Kinnunen was a visiting researcher at the Bank of Finland Institute for Economies in Transition (BOFIT). Kinnunen wishes to thank BOFIT for a pleasant stay at the Bank of Finland. Financial support from Jenny and Antti Wihuri Foundation is gratefully acknowledged.

1 Introduction

Standard capital asset pricing models imply that only systematic risk commands a risk premium in equilibrium. Since all investors hold a combination of the risk-free asset and the optimally diversified market portfolio, diversifiable idiosyncratic risk has no role in asset pricing. In reality, investors rarely hold optimal portfolios, especially in emerging stock markets. In the Russian stock market, as in many developing markets, investors are unable to diversify their portfolios optimally due to transaction costs (including liquidity-related costs such as bid-ask spreads) and information gathering and processing costs. According to asset pricing theories such as Merton (1987) and Levy (1978), incomplete diversification implies that investors demand a premium for bearing idiosyncratic risk.

While previous studies note several sources of risk affecting stock returns in Russia (Goriaev and Zapotkin, 2005; Fedorov and Sarkissian, 2000; Saleem and Vaihekoski, 2008; Kinnunen, 2013; Korhonen and Peresetsky, 2015), the relation between asset-specific idiosyncratic risk and expected returns has attracted little attention. Yet incomplete diversification combined with weak corporate governance and shareholder protection, high ownership concentration (Maury and Liljeblom, 2015), and potential conflicts of interest between small and large shareholders suggest that unique asset-specific risk affects stock returns in Russia. In the following, we estimate the price of idiosyncratic risk using a cross-section of Russian industry stock portfolios. Our results show that idiosyncratic risk is economically important in explaining cross-sectional variation in industry-level returns, thereby implying it plays a role in the pricing of Russian stocks.

The Russian stock market presents an interesting laboratory for investigating the pricing of idiosyncratic risk. While the number of listed stocks in Russia stayed relatively high after the mass privatizations of the 1990s, there were only about 40 stocks actively traded (stocks with trades registered on any given day) on the country's two main stock exchanges (RTS and MICEX) at the beginning of 2000 (see Goriaev and Zabotkin, 2006). While the number of actively traded stocks has since increased, it is clear that at the beginning of the millennium investors were unlikely to achieve optimal diversification in the Russian stock market even if they tried to diversify their portfolios optimally by holding all actively traded stocks in their portfolios. For example, Campbell et al. (2001) find that an investor needs about 50 randomly selected stocks to achieve near-complete portfolio diversification.

Theoretical explanations for an idiosyncratic risk premium (due to under-diversification) include incomplete information and other exogenous reasons such as taxes, transaction costs, and investment barriers (see Merton, 1987; Levy, 1987; Malkiel and Xu, 2002). In Russia, a number of reasons suggest under-diversification. First, the quality of public pricing information and liquidity of shares (measured by trading volumes or bid-ask spreads) vary cross-sectionally in the Russian stock market (see Goriaev and Zabotkin, 2006; Black et al., 2006). Second, investors often face substantial trading costs (including costs such as commissions, fees, and market impact costs) when operating in emerging stock markets (see Chan et al., 2005). Thus, even though the number of actively traded stocks has increased since 2000, incomplete information and trading and liquidity-related costs make it difficult to achieve complete portfolio diversification in Russia. The fact that Russia has one of the highest stock ownership concentrations in the world (see Maury and Liljeblom, 2015) further suggests under-diversification among investors in the Russian stock market.

Goetzmann and Kumar (2004) observe that many US household investors hold under-diversified portfolios even when the possibility to diversify is readily available. This highlights the likelihood of under-diversification among Russian retail investors. Specifically, while improving, weak corporate governance and investor protection in Russia (see e.g. Black et al., 2006) cause information asymmetries and indirect investment restrictions for foreign and retail investors. For instance, weak country-level shareholder protection [e.g. measured by the anti-self-dealing index of Djankov et al. (2008)] and poor corporate governance indicate that large shareholders and corporate managers may extract direct private benefits from their companies or exploit other investors via stock trading on the basis of material and non-public corporate information (see e.g. Fidrmuc et al., 2013).[1] As a result, investors may avoid investments in certain companies when they are unable to limit rent extraction by large shareholders and management (see Frankel and Li 2004). While this partly explains low rates of household stock market participation in Russia, it also forces

[1] Russia's new federal law on insider trading and market manipulation entered into force in 2011. The first insider trading case was filed in late 2013. In a recent survey (CFA Institute's Financial Market Integrity Outlook: 2011), almost half of the respondents considered market fraud (e.g. insider trading) as the most serious ethical issue facing the Russian stock market. Interestingly, Bhattacharya and Daouk (2002) find that the mere existence of insider trading laws has a negligible effect on the cost of equity in a country, while the initial enforcement of insider trading laws yields a significant decrease in the cost of capital.

foreign institutional investors to tilt their Russian portfolios toward the largest and most transparent companies, again implying under-diversification.[2]

Previous empirical evidence regarding the relation between idiosyncratic risk and stock returns is controversial. In developed stock markets, Malkiel and Xu (1997) and Fu (2009), among others, find that portfolios with high idiosyncratic risk tend to earn higher returns than portfolios with low idiosyncratic risk. Ang et al. (2006, 2009), on the other hand, document a negative relation. Bali and Cakici (2008) find that the effect of idiosyncratic risk is insignificant. In Asian stock markets, Nartea et al. (2011) document a positive relation between idiosyncratic risk and stock returns. Pukuanthong-Le and Visaltanachoti (2009) find support for a positive idiosyncratic risk premium for a number of developed and emerging markets. These mixed results are often related to omitted control variables and differences in how idiosyncratic risk is modeled (Huang et al., 2007; Fu, 2009; Choi 2009).[3] Recently, Avramov and Cederburg (2014) find support for a model that attributes these mixed results to the relations of idiosyncratic volatility with dividend size and expected dividend growth.

This study contributes to the discussion in three ways. First, we expand the limited evidence on the relation between expected returns and idiosyncratic risk in emerging stock markets. In Russia's case, previous studies highlight various sources of local and global risk factors affecting stock returns in Russia, but the relation between idiosyncratic risk and expected returns has attracted less attention. We identify a significant relation between expected returns and idiosyncratic risk in the Russian stock market. Idiosyncratic risk is economically significant and commands a negative (positive) risk premium, on average, of 10.0 (8.0) percent per year before (after) the global financial crisis in 2008–2009. Our results show that idiosyncratic risk is relevant in explaining cross-sectional variation in industry-level returns (which, in turn, implies that idiosyncratic risk plays an important role in capital budgeting and investment decisions in Russia). The results remain unaffected after controlling for global pricing factors and short-term return reversal.

[2] Malkiel and Xu (2002) argue that institutional investors often intentionally structure their portfolios to bear idiosyncratic risk in an attempt to earn abnormal returns. Because large companies in Russia can be assumed to have lower idiosyncratic risk, this seems implausible in the case of the Russia stock market.

[3] For example, according to Huang et al. (2007), results on the relation between idiosyncratic risk and stock returns should be controlled for stock return reversal. The latter explanation for the mixed results reflects the fact that idiosyncratic risk is not directly observable, so modeling assumptions may influence the obtained result (Fu, 2009; Choi 2009).

Second, we find that the price of idiosyncratic risk is time-varying and it has switched its sign from negative to positive after the start of the global financial crisis. According to asset pricing theories such as Merton (1987), the price of idiosyncratic risk should be positive. The negative relation between expected returns and idiosyncratic risk in the first part of the sample could reflect the hedging demands of investors for their high exposure to the performance of the oil and gas sector. Specifically, due to the limited number of actively traded stocks in Russia and the high market-weight of the oil and gas sector, investors may have been willing to pay a premium for idiosyncratic risk for the rest of the industry sectors as long as the overall diversification benefits outweighed the costs [for more discussion, see e.g. Eiling (2006)]. Fu and Schuette (2009) argue that the pricing of idiosyncratic risk in the US stock market weakens over time as institutional investors increase their role as the dominant players in the US stock market. It is likely that the switch in the price of idiosyncratic risk in the Russian stock market reflects developments in the market infrastructure, most notably increases in the degree of financial integration with the world capital market and the presence of foreign institutional investors.

The switch in the price of idiosyncratic risk may also indicate that investors have become more concerned about failures in corporate governance and unethical behavior of corporate executives in the aftermath of the recent global financial crisis (see e.g. Kirkpatrick 2009). In other words, investors may have started to demand positive compensation for the idiosyncratic risk of Russian stocks. Similarly, events such as Russia's annexation of Crimea and declining confidence on the Russian economy may have influenced the pricing principles of investors operating in the Russian stock market.

We find that the level of industry-specific idiosyncratic risk has decreased in the Russian stock market. This indicates that events such as the Ukraine crisis have affected Russian industry sectors mainly through common market movements, and *not* by increasing the level of unique industry-specific risk. Our finding may also reflect the fact that (due to the increased degree of financial integration) the performance of the Russian industry sectors has become more sensitive to the common global market movements over time. Nevertheless, the significant premium for idiosyncratic risk indicates that allocation of financial resources is still inefficient in the Russian stock market. Thus, stock market reforms that foster diversification opportunities and decrease transaction costs or information asymmetries between market participants should (in theory at least) contribute to economic growth in Russia by decreasing the cost of equity capital.

Third, previous studies mainly rely on the Fama-MacBeth methodology (with rolling OLS betas) to test the cross-sectional relation between idiosyncratic risk and expected returns. In contrast, we employ MIDAS regressions to estimate simultaneously conditional betas and time-varying price of idiosyncratic risk and factor loadings. For example, Gonzáles et al. (2012) conclude that MIDAS betas are better measures of risk than traditional OLS betas.[4] Moreover, previous studies on idiosyncratic risk usually assume full market segmentation and, consequently, do not control their cross-sectional regression for global pricing factors. However, Roll and Pukthuanthong (2009) find that the degree of global market integration has increased for most countries over the past decades. Goriaev and Zabotkin (2006) and Saleem and Vaihekoski (2008) show that the global stock factor has significant influence on the Russian stock market. We control our results for global pricing factors and short-term return reversal.

The rest of the paper is structured as follows. In Section 2, we discuss the theoretical models and the empirical framework. Section 3 contains data description, and Section 4 presents the empirical results. The final section concludes.

2 Model

2.1 Economic and empirical model

Asset pricing studies that assume optimal diversification often focus on alternative versions of conditional multifactor asset pricing models:

(1)
$$E_t\left(R^e_{j,t+1}\right) = \lambda_{mt}\beta_{jm,t} + \sum_{k=1}^{K}\lambda_{kt}\beta_{jk,t},$$

where $E_t(R^e_{j,t+1})$ is the conditional expected return on asset j in excess to the risk-free rate; $\beta_{jm,t}$ and $\beta_{jk,t}$ are the conditional betas with respect to the market portfolio and risk factor k, respectively; λ_{mt} is the conditional expected market risk premium; and λ_{kt} is the conditional expected risk premium on factor k.

A number of studies test Eq. (1) either in the above beta form (e.g. Gonzáles et al., 2012) or in its covariance form (e.g. Ghysels et al., 2005; Brandt and Wang, 2010; Ghysels

[4] Gonzáles et al. (2012) find that beta estimates under MIDAS have lower mean absolute forecasting errors and generate better out-of-sample performance of the optimized minimum variance portfolios (MVPs) relative to rolling OLS betas.

et al., 2014). Specifications of Eq. (1) include the capital asset pricing model (CAPM) of Sharpe (1964) and Lintner (1965), the international versions of the CAPM (e.g. Adler and Dumas, 1983), and the intertemporal CAPM (ICAPM) of Merton (1973). The underlying idea of these models is that investors hold optimally diversified portfolios in equilibrium. Since an asset's idiosyncratic risk can be diversified away, idiosyncratic risk has no role in asset pricing. Nevertheless, if investors fail to diversify their portfolios in an optimal way, theories such as Merton (1987) and Levy (1978) imply that investors demand a premium for bearing idiosyncratic risk. In this case, expected idiosyncratic risk on asset *j* should be included in Eq. (1) as an additional pricing factor.

Assuming that investors have rational expectations, expected returns in Eq. (1) can be replaced by realized returns and (zero mean) error terms. Here, we estimate the price of idiosyncratic risk using the MIDAS approach of Ghysels et al. (2005). Using a cross-section of Russian industry portfolios, we estimate the following system of equations:

(2) $$R^{e}_{j,t+1} = \mu + \gamma_t IVOL_{j,t} + \sum_{k=1}^{K} \lambda_{kt} \beta^{\text{MIDAS}}_{jk,t} + \varepsilon_{j,t+1}, \quad j = 1, \ldots, N,$$

where $R^{e}_{j,t+1}$ and $r^{e}_{j,t-d}$ denote the quarterly excess return on portfolio *j* from date *t* to *t*+1 and the lagged daily excess return on the same portfolio (both in excess to the risk-free rate), respectively. The subscript *t–d* denotes the date *t* minus *d* days. $\beta^{\text{MIDAS}}_{jk,t}$ (k = 1,..., K) are the conditional MIDAS betas with respect to the *K* risk factors, given by

(3) $$\beta^{\text{MIDAS}}_{jk,t} = \frac{\text{Cov}_t\left[R^{e}_{j,t+1}, F_{k,t+1}\right]}{\text{Var}_t\left[F_{k,t+1}\right]} = \frac{63\sum_{d=0}^{D} \frac{\exp\left(\omega_{k1}d + \omega_{k2}d^2\right)}{\sum_{s=0}^{D}\exp\left(\omega_{k1}s + \omega_{k2}s^2\right)} \times r^{e}_{j,t-d}\, f_{k,t-d}}{63\sum_{d=0}^{D} \frac{\exp\left(\varphi_{k1}d + \varphi_{k2}d^2\right)}{\sum_{s=0}^{D}\exp\left(\varphi_{k1}s + \varphi_{k2}s^2\right)} \times f^{2}_{k,t-d}},$$

where $F_{k,t+1}$ and $f_{k,t-d}$ denote the quarterly excess return and the lagged daily excess return on risk factor *k*, respectively; $IVOL_{j,t}$ denotes the expected idiosyncratic variance of portfolio *j* at time *t*+1, conditional on the information available at time *t*. γ_t is the price of idiosyncratic risk at time *t*+1, and pricing theories that assume under-diversification imply $\gamma_t > 0$. The intercept μ captures the average effect of missing factors.

Time-varying price of idiosyncratic risk and conditional factor loadings in Eq. (2) are modeled as linear functions of a number of instruments (included in the investors' information set at time *t*). The instruments include a constant, an indicator variable that equals one from January 2008 onwards (zero otherwise), and lagged quarterly percentage changes in gross domestic product. Nyberg (2012) and Ghysels et al. (2005) find that the risk-return trade-off in the US stock market varies with business cycle. Thus, our last instrument is a proxy for changes in the aggregate performance of the Russian economy.

The Russian stock market was hit particularly hard by the recent global financial crisis in 2008–2009. During the crisis and its volatile aftermath, transaction and information gathering costs soared, implying incomplete diversification. The post-January 2008 indicator variable thus captures the effect of the global financial crisis. In the aftermath of the financial crisis, investors became sensitive to failures in corporate governance and unethical behavior of corporate executives (see e.g. Kirkpatrick, 2009), implying further potential changes in the pricing of Russian stocks.

If the price of idiosyncratic risk is insignificant and factor loadings are restricted to be constant over time, the pricing system outlined by Eqs. (2)–(3) reduces to a conditional multifactor model with time-invariant factor loadings tested by Gonzáles et al. (2012).[5] Most studies use Fama-MacBeth regressions with rolling OLS betas to test the cross-sectional relation between idiosyncratic risk and expected returns. We employ the MIDAS approach because it allows simultaneous estimation of the time-varying price of idiosyncratic risk, assets' conditional betas, and conditional factor loadings. Gonzáles et al. (2012) conclude that MIDAS betas are better measures of risk than traditional (rolling) OLS betas. Moreover, empirical studies in emerging markets often face substantial data limitations. The pricing system given by equations (2) and (3) can be estimated with a few or many test assets, whereas Fama-MacBeth regressions always require several test assets.

The systematic risk factors and the modeling of idiosyncratic risk are discussed in detail below. In practice, we set $K = 2$ and the set of all parameters is estimated simultaneously by non-linear least squares. The standard errors of the parameter estimates are adjusted for heteroscedasticity and autocorrelation (up to four lags) using the approach developed by Newey and West (1987).

[5] For more details on MIDAS models and the weight coefficients in Eq. (2), see Ghysels et al. (2005) and Gonzáles et al. (2012).

2.2 Systematic risk factors

The pricing of idiosyncratic risk is always tested with respect to an equilibrium model with a set of systematic pricing factors. As discussed by Kinnunen (2013), the difficulty of choosing an adequate equilibrium model for emerging market returns includes the question of whether the global market risk or the local market risk or both should command a risk premium. In other words, we must assess whether a country's financial market is integrated with world capital markets. Roll and Pukthuanthong (2009) report that the degree of global market integration has increased for most countries over the past decades. Chambet and Gibson (2008) and Bekaert et al. (2011), on the other hand, report that, emerging markets are still at least partially segmented. Goriaev and Zabotkin (2006) and Saleem and Vaihekoski (2008) report a significant influence of the global equity market on the performance of the Russian stock market, yet both studies report that the Russian stock market seems to be partially segmented. Thus, we test the relation between returns and idiosyncratic risk assuming that the Russian stock market is partially segmented and, therefore, use the excess return on the local market factor and the excess return on the global market factor as the market factors.

2.3 Idiosyncratic risk

Idiosyncratic risk measures asset-specific risk unrelated to an asset's systematic risk. Since we test the pricing of idiosyncratic risk using a cross-section of industry portfolios, idiosyncratic risk here refers to risk that is unique to a specific industry. Following previous studies (e.g. Ang et al., 2006; 2009), we proxy the next quarter's expected idiosyncratic risk by the last quarter's realized idiosyncratic risk. Thus, for each quarter we regress daily excess returns of each industry portfolio on the risk factors and proxy $IVOL_{j,t}$ by the variance of the regression residuals multiplied by 63. Motivated by Dimson (1979), we control the estimates of the idiosyncratic risk for the effects of non-synchronous trading using the following time-series regression:

$$(4) \quad r_d^e = \alpha + \beta_1 f_{Russia,d} + \beta_2 f_{Russia,d-1} + \beta_3 f_{Russia,d-2} + \beta_4 f_{World,d} + \beta_5 f_{World,d-1} + \beta_6 f_{World,d-2} + \varepsilon_\tau ,$$

where d denotes the day; $f_{Russia,\tau}$ is the excess return on the local stock market factor; $f_{World,\tau}$ denotes the excess return on the global market factor. We run the regression for each portfolio in each quarter and use the variance of the residuals as the proxy for idiosyncratic risk.

3 Data

The relation between stock returns and idiosyncratic risk is investigated using excess log-returns on four value-weighted industry portfolios. The sample period runs from Q3/1999 to Q3/2014 (62 quarters). The sample consists of 248 industry-quarter observations. The industrial sectors included here are telecommunication, consumer services, utilities, and the financial sector. The performance of the given industrial sector is measured by the respective value-weighted Thomson Datastream sector index. As the proxy for Russian equity market performance, we use the value-weighted Thomson Datastream equity index. The global stock market return is approximated using the value-weighted Thomson Datastream Global Equity index. The risk-free rate is obtained from Kenneth French's webpage (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/). All data (except the risk-free rate) are from Thomson Datastream.

All returns are total returns (adjusted for dividends and stock splits) and in US dollars and decimal form. Quarterly excess returns are obtained by compounding the daily excess returns.

The oil and gas sector is excluded from the analysis for two reasons.[6] First, the market-weight of the sector in the Russian stock market is very high, implying that the sector's idiosyncratic risk is extremely low and that the expected local market premium should be close to the expected return on the sector. This suggests that the estimation of the system of equations (all in a beta form) could be heavily influenced (and potentially biased) by the inclusion of the oil and gas sector. Second, most previous studies analyze the Russian aggregate stock market, suggesting that their results heavily reflect the performance of the Russian oil and gas sector, while the pricing of the rest of the industries remains largely unexplored.

Table 1 reports the summary statistics for the industry-level excess return series. The table reveals several interesting findings. The mean of the excess returns series appears to increase approximately linearly with the mean of the estimated industry-specific idiosyncratic risk series. This finding comports with the view that idiosyncratic risk commands a positive risk premium and plays a role in explaining cross-sectional variation in the excess

[6] The four industry sectors considered here have a combined market-weight of 30% in the DS Russian Market index. These four sectors closely represent the composition of the Russian stock market when the oil and gas sector is excluded. The only significant industry sector missing from our sample is basic materials. The index that measures the performance of this sector has limited time coverage and, consequently, we are forced to exclude this sector.

returns. The mean of the quarterly excess returns also varies between 0.2% and 8.0%, suggesting that there has been considerable cross-sectional variation in industry-level returns. The standard deviation of the excess return series ranges between 27.3% and 32.1%. This shows that the sample period is characterized by high risk.

We concentrate on quarterly returns as autocorrelation in short-horizon returns could affect the results regarding the pricing of idiosyncratic risk, especially in emerging stock markets [for more details, see Kinnunen (2013; 2014)]. The lack of significant autocorrelation in the quarterly excess return series implies that it is not necessary to control our results for serial dependence in returns.

4 Empirical results

4.1 Price of idiosyncratic risk

Table 2 shows the empirical results from the MIDAS regressions outlined in Eqs. (2)–(3). To compare the economic relevance of idiosyncratic risk, estimation results are reported for the baseline model with idiosyncratic risk (Model 1) and a model without idiosyncratic risk (Model 2). Time-variation in the price of idiosyncratic risk and the local and the global market premium are modeled as linear functions of the lagged instrument variables. As discussed in Section 2.1, the instruments include a constant, an indicator variable that equals one from January 2008 onwards (zero otherwise), and quarterly percentage changes in GDP.

Panel A of Table 2 shows the parameter estimates. The common intercept term is not statistically significantly different from zero, suggesting that the average effect of missing factors is insignificant. The constant parameters and the coefficients for the post-January 2008 indicator variable are statistically significant for the price of idiosyncratic risk and for the local market premium, while both corresponding coefficients stay statistically insignificant for the global market premium. The parameters for the quarterly percentage changes in gross domestic product are statistically significant (insignificant) for the global and the local market premium (price of idiosyncratic risk). These results imply that there has been a stepwise increase (decrease) in the price of idiosyncratic risk (local market premium) in the latter part of the sample. Similarly, it seems that the amount of compensation required for bearing local and global market risk varies over time with changes in the performance of the Russian aggregate economy (measured by GDP). The price of idiosyncratic risk, in contrast, does not fluctuate with the quarterly percentage changes in GDP.

Panel B of Table 2 shows the Wald-test statistics for the null hypotheses that 1) the compensation required for bearing the given risk is zero and 2) the required compensation does not vary over time with the instrument variables. The null hypothesis of zero compensation is rejected for idiosyncratic risk, as well as for the local and the global market risk. Based on the Wald-tests, the price of idiosyncratic risk and the local market premium are both clearly time-varying. While the joint null of constant global premium is only rejected with Model 2, the fact that the coefficient for the percentage changes in GDP is the only significant coefficient for both models suggests that the global market premium fluctuates over time.[7] These results suggest that idiosyncratic risk influences expected industry-level returns in Russia, along with the global and the local market factor. The findings regarding the systematic risk factors are similar to the findings of Saleem and Vaihekoski (2008) and Goriaev and Zabotkin (2006).

Panel C of Table 2 shows some goodness-of-fit statistics. Based on the average MPEs (mean pricing error), the model with idiosyncratic risk clearly outperforms the model without idiosyncratic risk. The same conclusion is reached based on the average MSPEs (mean squared pricing errors), while the difference in the model's performance is more modest. Looking at the evidence overall, it appears that, in addition to its statistical significance, idiosyncratic risk is economically important in explaining cross-sectional variation in industry-level returns. This finding comports with the results of Levy (1978) and Fu (2009), among others. The finding is also in line with Pukuanthong-Le and Visaltanachoti (2009), who find a positive idiosyncratic risk premium for a number of developed and emerging stock markets.

Having established that the required compensation for the three different sources of risk are time-varying, we use the parameter estimates for Model 1 and the instrument variables to calculate time series for the price of idiosyncratic risk and market premia. The evolution of the price of idiosyncratic risk is plotted in Figure 1. As can be seen, there has been a considerable change in the price of idiosyncratic risk after the start of the global financial crisis (the price of idiosyncratic risk switches sign from negative to positive). The documented negative relation between expected returns and idiosyncratic risk in the first part of

[7] Theoretically, it is unrealistic that the premium for the global market risk (demanded by the representative global investor) should fluctuate with changes in the performance of the Russian economy. In practice, however, the premium for the global market risk for Russian assets (demanded by investors who operate in the Russian stock market) may well change with the performance of the Russian economy. Furthermore, by using the same instruments for the three different sources of risk, we are able to compare directly the evolution of the price of idiosyncratic risk (the main topic of this study) with the evolution of market premia over time.

the sample is in line with the empirical results of Ang et al. (2006; 2009). On the other hand, the estimated positive price of idiosyncratic risk in the second part of the sample follows the findings of Fu (2009).

According to asset pricing theories such as Merton (1987), the price of idiosyncratic risk should be positive. An economic explanation for the negative price of idiosyncratic risk in the first part of the sample can be related to investors' hedging demands (see e.g. Eiling, 2006). In the Russian stock market, this negative relation may reflect the hedging demands of investors for their high exposure to the oil and gas sector's performance. More specifically, because of the limited number of actively traded stocks and the high market-weight of the oil and gas sector, investors may have been willing to pay a premium for idiosyncratic risk for all other industry sectors once they considered the overall diversification benefits to outweigh the costs.

The switch from a negative price to positive price of idiosyncratic risk may be related to developments in the market infrastructure, including increases in the degree of financial integration with the world capital market and the presence of foreign institutional investors. For example, Fu and Schuette (2009) argue that the pricing of idiosyncratic risk in the US stock market weakens over time as institutional investors strengthen their role as the dominant players in the US stock market. Second, in the aftermath of the recent global financial crisis, investors have become more concerned about corporate governance failures and unethical behavior of corporate executives (see e.g. Kirkpatrick 2009). Due to this type of development, investors may have started to demand a positive compensation for idiosyncratic risk in Russia. Irrespective of recent developments in corporate governance and investor protection [for more details, see Black et al. (2006) and Maury and Liljeblom (2015)], poor corporate governance and weak investor protection remain concerns in Russia. Third, it is likely that events such as Russia's annexation of Crimea and declining confidence on the Russian economy have changed the pricing principles of investors operating in the Russian stock market.

Figure 2 plots conditional risk premia. As can be seen from the parameter estimates in Table 2, the conditional premia for the local and the global market risk move in opposite directions with the changes in the performance of the aggregate economy. The conditional global market premium is mostly positive as suggested by international asset pricing theories. The conditional local market premium, on the other hand, is often negative. Given that idiosyncratic risk appears to be important in explaining cross-sectional variation in industry-level stock returns in Russia, it is unsurprising that the premium for the local stock market portfolio is at odds with the predictions of asset pricing theories that assume optimal diversification [for more details, see Levy (1978)]. A negative premium is also unsurprising in that the performance of the Russian aggregate stock market portfolio heavily reflects the performance of the oil and gas sector (suggesting it may be an inadequate proxy for the true market portfolio). Furthermore, Kinnunen (2013) finds that standard conditional asset pricing models even fail to explain the performance of the Russian aggregate stock market itself.

4.2 Economic relevance of idiosyncratic risk

The fact that idiosyncratic risk is a priced factor in the Russian stock market implies that idiosyncratic risk plays a role in capital budgeting and investment decisions in Russia. We now assess the economic relevance of idiosyncratic risk by calculating the expected risk premiums for idiosyncratic risk and the other sources of risk for industry *j*. The total premium for each industry is simply calculated as the fitted value from the MIDAS regression with idiosyncratic risk. Following studies such as De Santis et al. (2003), the premiums for the three different sources of risk for industry *j* are calculated using the following definitions:

Idiosyncratic risk premium: $\gamma_t IVOL_{j,t}$

Local market premium: $\lambda_{RUSt} \beta_{jRUS,t}^{\mathrm{MIDAS}}$

Global market premium: $\lambda_{WORLDt} \beta_{jWORLD,t}^{\mathrm{MIDAS}}$

Table 3 reports summary statistics for the industry-specific premiums. All statistics are reported for the full sample period and the pre-January 2008 sub-sample and for the mean difference between the two sub-samples (pre- and post-January 2008). The results show that the industry-specific total premiums range between 2.40 (9.6) and 5.85 (23.4) percent per quarter (year). Before January 2008, the average industry-specific premiums for idiosyncratic risk fluctuate between –1.73 (–6.92) and –3.77 (–15.08) percent per quarter (year). During the post-January 2008 period, the corresponding estimates are between 1.27 (5.08) and 3.00 (12.00) percentages per quarter (year).

The right-hand column shows the average of the industry-specific average premiums. Looking at the evidence overall, idiosyncratic risk is economically highly significant and commands a negative (positive) risk premium, on average, of 10.04 (8.04) percent per year before (after) January 2008. Thus, at least in theory, stock market reforms that would foster diversification opportunities and decrease transaction costs or information asymmetries between market participants should decrease the cost of equity and, consequently, contribute to economic growth in Russia.

Figures 3a–d plot the industry-specific premiums for idiosyncratic risk and the amount of industry-specific idiosyncratic risk (multiplied by 100). The figures indicate that the level of industry-specific idiosyncratic risk has decreased in the Russian stock market.

To assess long-term time-trends in the level of idiosyncratic risk, we regress the estimated idiosyncratic risk series for industry j on a constant and time-trend t/T. The results from these regressions are reported in Table 4. Apparently, the level of industry-specific idiosyncratic risk has decreased in the Russian stock market. Thus, our results indicate that events such as the Ukraine crisis have affected Russian industry sectors mainly through common market movements, and *not* by increasing the level of industry-specific unique risk. This finding further reflects the fact that, due to increased financial integration, the performance of Russian industry sectors has become more sensitive to common global market movements over time.

Theories such as the incomplete-information model of Merton (1987) indicate that the cost of idiosyncratic risk depends, among other things, on the asset's investor base and its exposure to the common market factor (which varies across firms when the degree of financial integration is asset-specific). Even if a country is integrated with the global capital market, Carrieri et al. (2004) argue that there may be variations in the degree of integration across that country's industry sectors. This situation can result e.g. from industry-specific foreign ownership restrictions or limited presence of firms on foreign exchanges. Fedorov and Sarkissian (2000) report differences in the degree of integration across Russian industry sectors. Their results show that the most highly integrated industries include firms that are either actively traded on foreign exchanges or sell a significant part of their output on global markets. Thus, in Russia's case, the investor base and common market factor appear to vary across firms and industries with the degree of firm-specific integration. Moreover, once a company cross-lists its shares on a foreign exchange, stringent disclosure requirements are likely to increase the quality of the firm's public information (see e.g. Bailey et al., 2006). Thus, the observed variation in the industry-specific risk premiums for idiosyncratic risk can be related, at least partially, to differences in the degree of financial integration across industry sectors.

4.3 Model misspecification test

Additional factors may command risk premia in emerging markets. As a test of possible model misspecification, we estimate the following augmented model:

$$R^e_{j,t+1} = \lambda_0 + \gamma IVOL_{j,t} + \sum_{k=1}^{K} \lambda_k \beta^{\text{MIDAS}}_{jk,t} + \sum_{m=1}^{M} \theta_m X_{jm,t} + \varepsilon_{j,t+1}, \quad j = 1,\dots,N, \tag{5}$$

where $X_{jm,t}$ ($m = 1,\dots,M$) denote the M control variables. In practice, we set M=3 and use the same two k-factors as previously.

As the first control variable, we consider an industry's beta with the change in the oil price. Eq. (1) is a factor model, and as such, a special case of the general consumption-based model. As discussed by Kinnunen (2013), changes in oil price may proxy for marginal utility growth in Russia, as the country's economy relies on global oil supply and demand. This suggests that changes in oil price may also influence stock prices in Russia. Results reported by Goriaev and Zabotkin (2006) and Kinnunen (2013) support this view. In addition, Basher and Sadorsky (2006) report that oil price risk influences stock returns in various emerging markets.

International asset pricing theories such as Adler and Dumas (1983) predict that exchange-rate risk is priced under certain conditions. In these models, the covariances of asset returns with exchange rates command risk premia. The underlying idea is that deviations from purchasing power parity (PPP) induce new premia beyond the market premium. Investors in different countries have access to consumption goods at different prices and, consequently, investors across countries view the return on the same asset differently. Russian investors, for example, grant a premium on assets that protect their real purchasing power, while US investors grant a different premium for the same assets. Saleem and Vaihekoski (2008) and Goriaev and Zabotkin (2006) find support for the pricing of the currency risk in Russia. Therefore, we use an industry's beta with the change in the USD/RUB exchange rate as the second control variable.

An industry's conditional betas with the change in the oil price and the exchange-rate risk are modeled using the last quarter's realized betas as proxies for the next quarter's expected betas. In each quarter, we regress the daily excess returns of each industry portfolio on the changes in the oil price and the exchange rate. This is done estimating the time-series regressions similar to Eq. (4), but replacing the local market factor and the global market factor with changes in the Brent oil price and the USD/RUB exchange rate (both in excess to the risk free-rate). For each industry, the proxy for the quarterly beta is the sum of the three slopes with the particular control factor (see e.g. Lewellen and Nagel, 2006). Obviously, we could estimate the control betas using the MIDAS approach [see Eq. (2)], but this would significantly increase the model's non-linearity and cause problems with the numerical estimation of the model parameters.

In addition to the short-term return reversal (past losers outperform past winners) documented by a number of authors, Jegadeesh and Titman (1993) show that over an intermediate time horizon, there is momentum effect in stock prices (past winners continue to outperform past losers). Here, we include the lagged quarterly returns on the industry portfolios in the system of equations (2) to control for return reversal or persistence in stock returns. Short-term return reversal and momentum in stock returns are cross-sectional results, but both can be related to autocorrelation in returns and cross-autocorrelation among stock returns. In emerging stock markets, return autocorrelation and lead-lag relations among stocks are both highlighted. Harvey (1995), for example, reports that serial correlations observed in emerging stock market returns are higher than those found in developed markets.

Why should we control our results for return persistence or return reversal? Ang et al. (2006) find that monthly stock returns are negatively related to the one-month lagged idiosyncratic volatilities. Huang et al. (2007) and Fu (2009) argue that the negative relation can be largely explained by the return reversal of stocks with high idiosyncratic volatilities. Specifically, stocks with high idiosyncratic volatilities are shown to have high contemporaneous returns. The positive abnormal returns tend to reverse, resulting in negative abnormal returns in the following month. This may explain the negative relation between the lagged idiosyncratic volatility and the next period's stock returns documented by Ang et al. (2006). As a result, it is important to control results regarding the pricing of idiosyncratic risk for return reversal.

After estimating Eq. (5), we find that the results (untabulated) stay practically unchanged. None of the individual coefficients for the control variables is statistically significant at the 10%-level. The Wald-test for the joint null hypothesis of no additional predictive power of the control variables is not rejected at any conventional significance level. The Wald-statistic is distributed as $\chi2(3)$ and gets a value of 1.409. The rest of the coefficients and the corresponding Wald-tests show that conclusions concerning the pricing of idiosyncratic risk and the significance of the global and the local market factor stay unchanged. The above results imply that the model is not misspecified in the sense that additional risk factors or short-term return reversal would influence the obtained results.

5 Conclusions

In this paper, we investigated the relation between expected returns and idiosyncratic risk in the Russian stock market. This was accomplished by testing an empirical version of a conditional asset-pricing model with industry-specific idiosyncratic risk. We estimated the price of idiosyncratic risk using MIDAS regressions and a cross-section of Russian industry stock portfolios using quarterly data from Q3/1999 to Q3/2014.

There are three key findings. First, idiosyncratic risk is economically significant and commands a negative (positive) risk premium, on average, of 10.0 (8.0) percent per year before (after) the global financial crisis in 2008–2009. Our results show that idiosyncratic risk is relevant in explaining cross-sectional variation in expected industry-level returns, i.e. idiosyncratic risk plays a role in capital budgeting and investment decisions in Russia. Industry-specific premiums for idiosyncratic risk vary cross-sectionally and over time. The results remain unaffected after controlling for global pricing factors and short-term return reversal.

Second, the price of idiosyncratic risk is time-varying and it has switched its sign from negative to positive after the start of the global financial crisis. The negative relation between expected returns and idiosyncratic risk in the first part of the sample can be explained by investor hedging demands for their high exposure to oil and gas sector performance. While the switch to a positive price may reflect developments in market infrastructure, the switch could also reflect the fact that in the aftermath of the recent global financial crisis investors have become more concerned about failures in corporate governance and unethical behavior of corporate executives. In either case, investors seem to have started to demand positive compensation for bearing idiosyncratic risk in Russia. Similarly, events such as Russia’s annexation of Crimea and declining confidence on the Russian economy may have influenced the pricing principles of investors operating in Russia.

Third, we find that the level of industry-specific idiosyncratic risk has decreased in the Russian stock market. Thus, our results indicate that events such as the Ukraine crisis have affected Russian industry sectors mainly through common market movements, and not by increasing the level of industry-specific unique risk. This finding further reflects the fact that the performance of Russian industry sectors has become more sensitive to common global market movements over time due to the increased degree of financial integration.

The pricing of idiosyncratic risk is economically motivated by incomplete portfolio diversification. The significant premium for idiosyncratic risk indicates that allocation of financial resources is inefficient in the Russian stock market. Thus, at least in theory, stock market reforms that foster diversification opportunities and decrease transaction costs or information asymmetries between market participants should contribute to economic growth in Russia by decreasing the cost of equity capital.

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Tables and figures

Table 1 Summary statistics of the quarterly excess returns

Quarterly excess return data are from Q3/1999 to Q3/2014 (62 quarters). The sample consists of 248 industry-quarter observations. Excess returns are measured as log-returns on four value-weighted industry portfolios in excess to the risk-free rate. All excess returns are in US dollars in decimal form. The risk-free rate is obtained from Kenneth French's webpage. The second column shows the mean of idiosyncratic risk for industry *j*. The industrial sectors included in the analysis are the following: telecommunication, consumer services, utilities, and financial sector. The performance of the given industrial sector is measured by the respective value-weighted Thomson Datastream sector (total return) index.

	Mean	IVOL (mean)	Std. dev.	Skew-ness	Kurtosis (excess)	Autocorrelations			
						ρ_1	ρ_2	ρ_3	ρ_4
Consumer services	0.080	0.036	0.273	0.267	5.126	–0.107	–0.022	–0.008	–0.152
Tele-communications	0.036	0.017	0.279	0.317	1.856	–0.164	–0.094	0.187	–0.161
Financial	0.067	0.026	0.321	–0.120	0.933	0.021	0.044	0.092	–0.168
Utilities	0.002	0.017	0.285	–0.297	0.570	0.048	0.003	0.016	–0.164

Table 2 Price of idiosyncratic risk

This table shows results for the following MIDAS regression:

$$R^{e}_{j,t+1} = \mu + \gamma_t IVOL_{j,t} + \sum_{k=1}^{K} \lambda_{kt} \beta^{\text{MIDAS}}_{jk,t} + \varepsilon_{j,t+1}, \quad j = 1,..., N,$$

where the conditional MIDAS betas with respect to the local (RUS) and the global (WORLD) market factor are given by Eq. (3). The time-varying price of industry-specific idiosyncratic risk, γ_t, and time-varying local and global market premia, λ_{RUS} and λ_{WORLD}, are modeled as linear functions of a number of instruments included in the investors' information set. The instruments include a constant, an indicator variable that equals one from January 2008 onwards (zero otherwise), and quarterly percentage changes in the gross-domestic product. Industry-specific idiosyncratic risk $IVOL_{jt}$ is modeled using Eq. (4). The sample period runs from Q3/1999 to Q3/2014. The parameters are estimated simultaneously by non-linear least squares. The estimates of the weight coefficients in Eq. (3) are not reported. All standard errors (in parentheses) are adjusted for heteroscedasticity and autocorrelation (up to four lags) using the approach of Newey and West (1987). Panel B shows the Wald-test statistics (*p*-values in brackets). Panel C reports the average MSPE (mean squared pricing error) and the average MPE (mean pricing error). ***, **, and * denote significance at the levels of 1%, 5%, and 10%, respectively.

	Model 1 (idiosyncratic risk)		Model 2 (no idiosyncratic risk)	
Panel A: Parameter estimates				
Intercept				
μ	0.040	(0.032)	0.031	(0.034)
Price of idiosyncratic risk				
γ_{CONSTANT}	–0.947*	(0.533)		
γ_{POST2008}	2.725**	(1.297)		
$\gamma_{\%\Delta\text{GDP}}$	0.107	(0.211)		
Local market premium				
$\lambda_{\text{RUS\_CONSTANT}}$	0.250***	(0.080)	0.225***	(0.062)
$\lambda_{\text{RUS\_POST2008}}$	–0.358***	(0.084)	–0.341***	(0.079)
$\lambda_{\text{RUS\_}\%\Delta\text{GDP}}$	–0.155***	(0.053)	–0.159***	(0.043)
Global market premium				
$\lambda_{\text{WORLD\_CONSTANT}}$	–0.056	(0.057)	–0.038	(0.049)
$\lambda_{\text{WORLD\_POST2008}}$	0.099	(0.066)	0.091	(0.060)
$\lambda_{\text{WORLD\_}\%\Delta\text{GDP}}$	0.061**	(0.030)	0.059**	(0.026)
Panel B: Wald-tests				
Zero local market premium, $\chi^2(3)$	18.775***	[<0.001]	21.102***	[<0.001]
Constant local market premium, $\chi^2(2)$	18.380***	[<0.001]	20.361***	[<0.001]
Zero world market premium, $\chi^2(3)$	18.524***	[<0.001]	7.585*	[0.055]
Constant world market premium, $\chi^2(2)$	4.523	[0.104]	5.261*	[0.072]
Idiosyncratic risk is not priced, $\chi^2(3)$	14.721***	[0.002]		
Constant price of idiosyncratic risk, $\chi^2(2)$	4.921*	[0.085]		
Panel C: Goodness of fit				
Avg. MPE	0.0005		0.0047	
Avg. MSPE	0.0572		0.0574	

Table 3 Average risk premiums for industries

This table reports the average and standard error of the estimated premiums for local and global market risk and idiosyncratic risk for industry *j*. The last column shows the average of the industry-specific premiums. All premiums are quarterly measures and in decimal form. All statistics are reported for the full sample period and the pre-January 2008 period and for the mean difference between the sub-samples (pre- and post-January 2008).

	Consumer services	Tele-communications	Financial	Utilities	Average
Total premium					
Full sample	0.0585	0.0353	0.0240	0.0331	0.0377
Pre-2008	0.0599	0.0477	0.0421	0.0478	0.0494
ΔPost-2008	–0.0034	–0.0280	–0.0409	–0.0333	–0.0264
Global market premium					
Full sample	0.0798	0.0667	0.0657	0.0827	0.0737
Pre-2008	0.0658	0.0524	0.0486	0.0547	0.0554
ΔPost-2008	0.0316	0.0321	0.0387	0.0634	0.0414
Local market premium					
Full sample	–0.0533	–0.0674	–0.0762	–0.0852	–0.0706
Pre-2008	–0.0079	–0.0265	–0.0185	–0.0292	–0.0205
ΔPost-2008	–0.1026	–0.0924	–0.1304	–0.1267	–0.1130
Idiosyncratic risk premium					
Full sample	–0.0077	–0.0036	–0.0051	–0.0040	–0.0051
Pre-2008	–0.0377	–0.0179	–0.0276	–0.0173	–0.0251
ΔPost-2008	0.0677	0.0323	0.0508	0.0300	0.0452

Table 4 Time-trends in idiosyncratic risk

This table reports the results from the linear time-trend regressions. The estimated idiosyncratic risk for industry *j* is regressed on a constant and a time-trend *t/T*. All standard errors (in parentheses) are adjusted for heteroscedasticity and autocorrelation (up to four lags) following the approach of Newey and West (1987). ***, **, and * denote significance at the levels of 1%, 5%, and 10%, respectively.

	Consumer services	Tele-communications	Financial	Utilities	Average
Constant	0.0781***	0.0394***	0.0430***	0.0397***	0.0501***
	(0.0251)	(0.0097)	(0.0146)	(0.0114)	(0.0094)
Time-trend	–0.0829**	–0.0439***	–0.0331**	–0.0450***	–0.0512***
	(0.0358)	(0.0141)	(0.0158)	(0.0166)	(0.0135)

Figure 1 Price of idiosyncratic risk

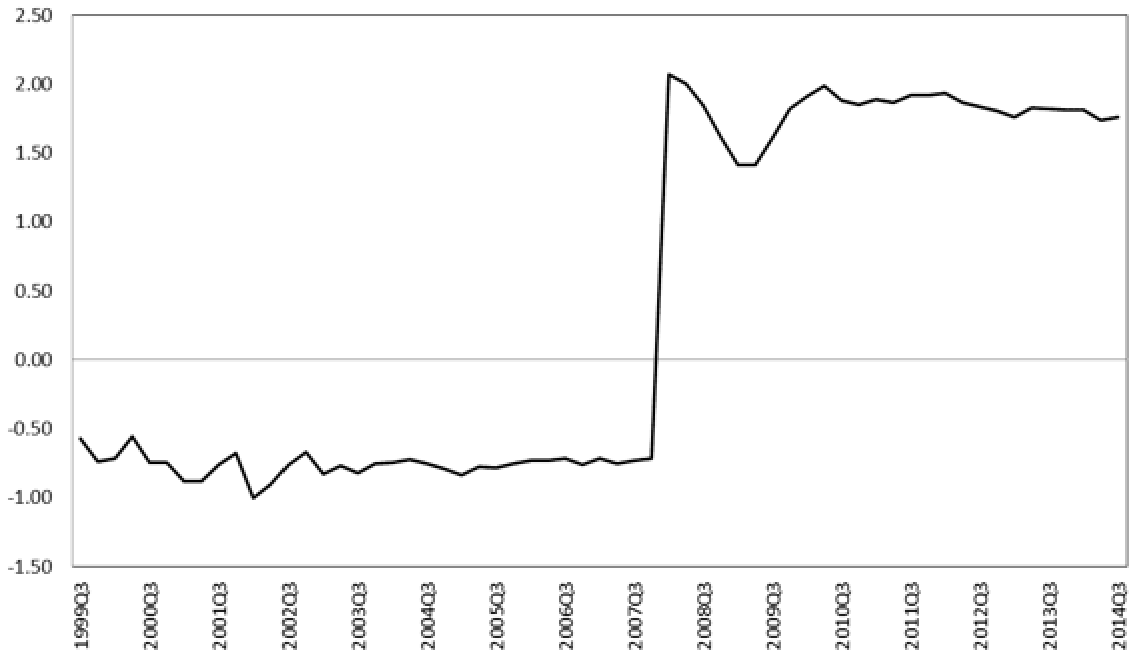


Figure 2 Global and local market premia

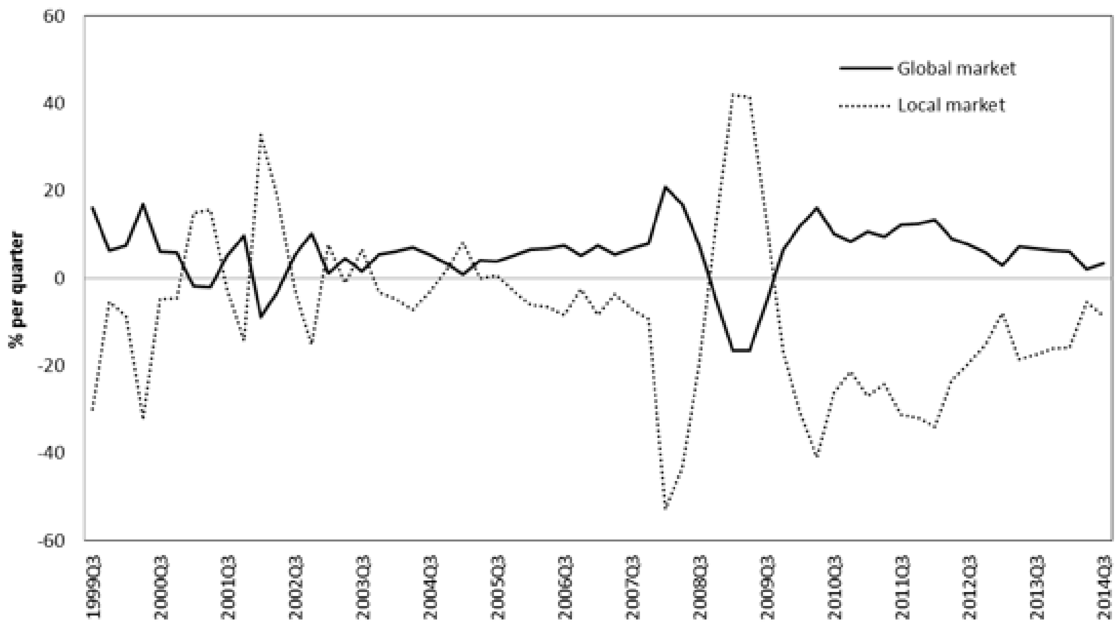


Figure 3a Risk premium for idiosyncratic risk – Consumer services

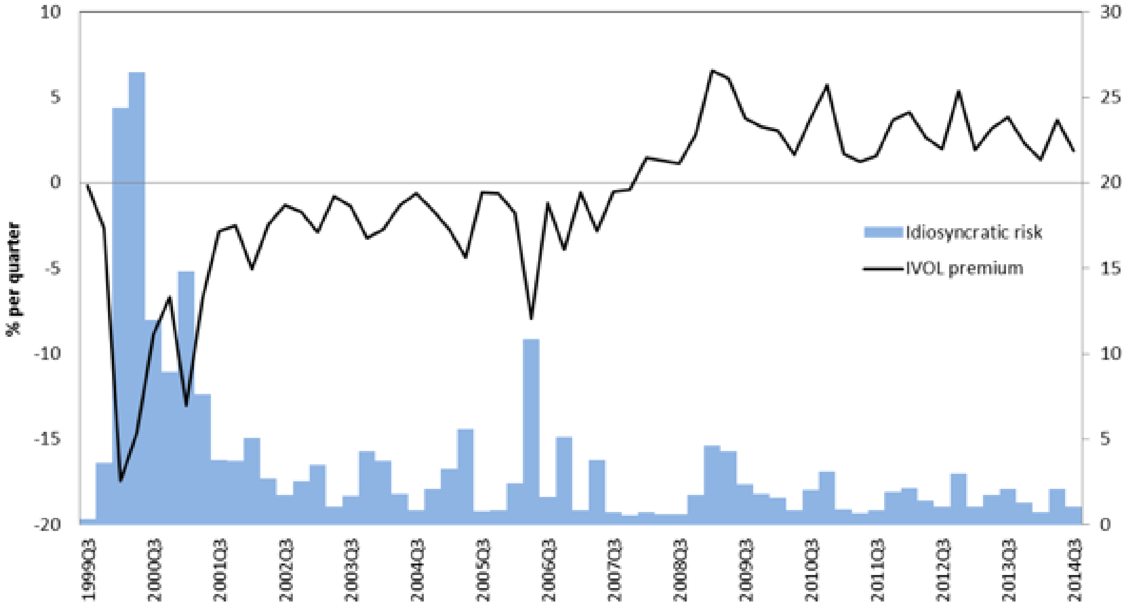


Figure 3b Risk premium for idiosyncratic risk – Telecommunications

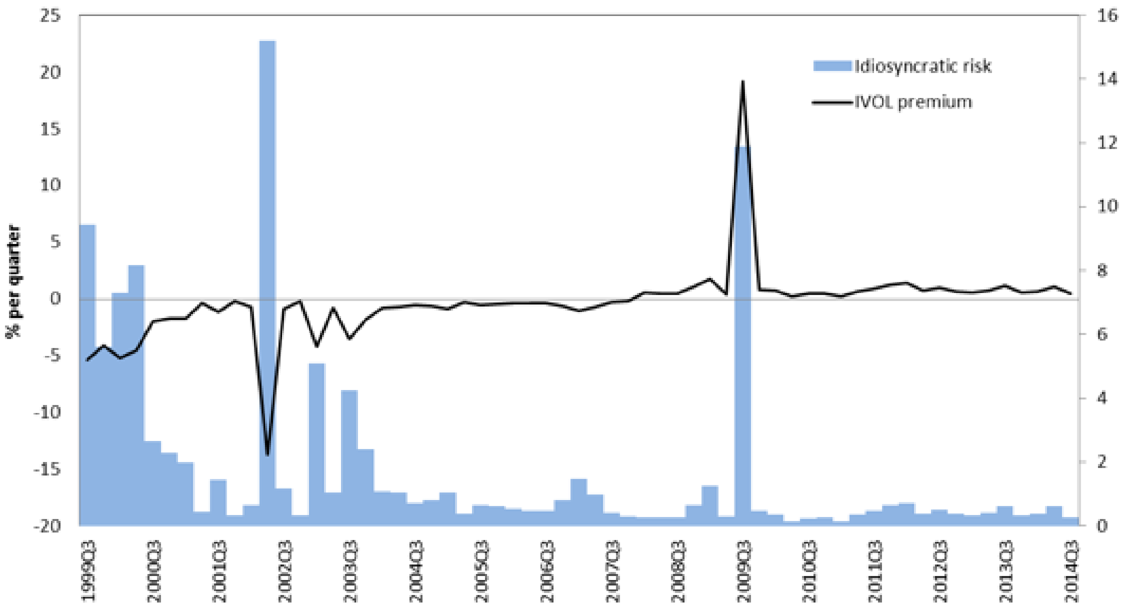


Figure 3c Risk premium for idiosyncratic risk – Financial sector

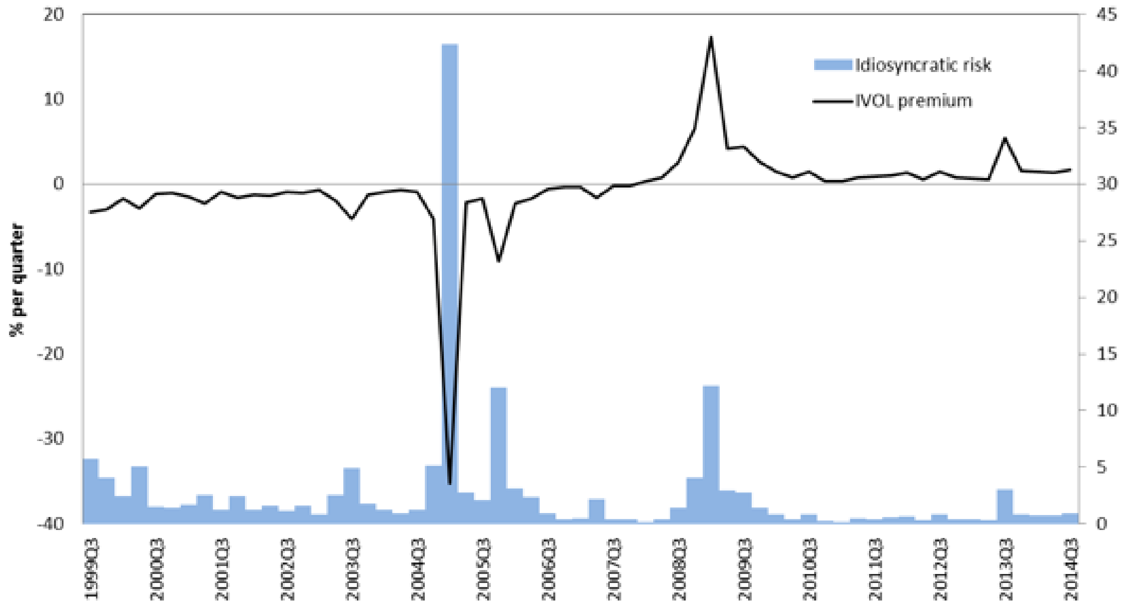
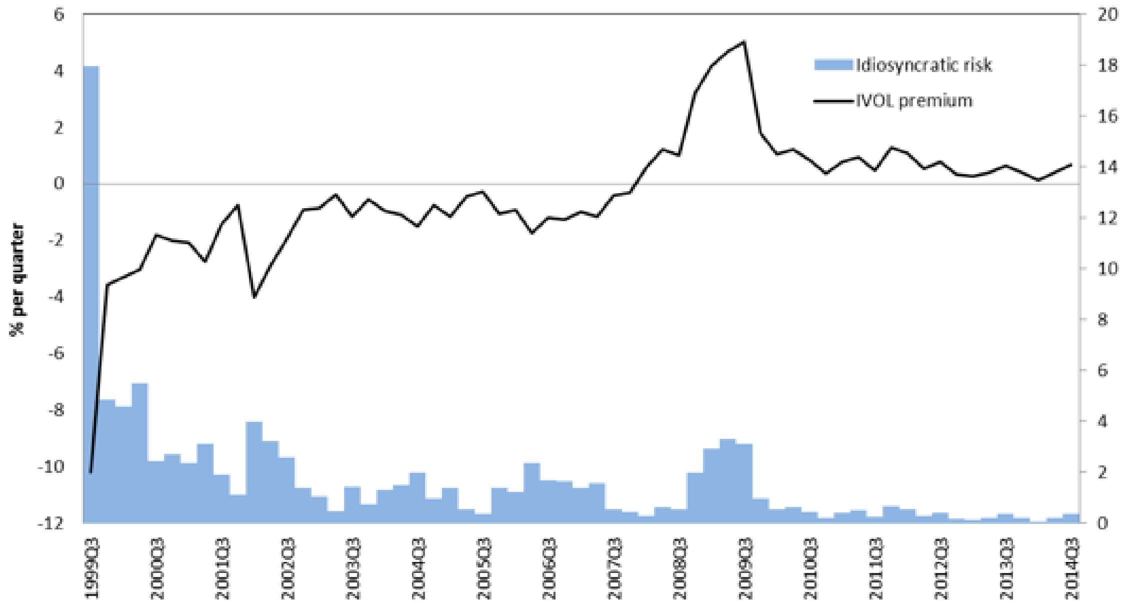


Figure 3d Risk premium for idiosyncratic risk – Utilities



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ISSN 1456-4564 (print) // ISSN 1456-5889 (online)