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Full Length Research Paper

The impact of macroeconomic indicators on stock exchange performance in Kazakhstan

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This paper aims to investigate the causal relationship between macroeconomic indicators and Kazakhstan stock exchange (KASE) index. The results indicate the existence of cointegrations between these series implying violation of market efficiency hypothesis. The results of the study are in compliance not only with theory but also with the issues in practice. Using the bound testing approach, within the Autoregressive Distributed Lag (ARDL) model framework, we examine their long-run relationship. Johansen Cointegration test, Engel-Granger two-step approach and Granger causality test reveal that the main determinants of KASE are income per capita, inflation and the exchange rate and dummy variable accounting for worldwide crisis impact. Other effect on stock index comes from oil price volatility measure, causing windfall gain effect as a consequence of rapid, but temporary, increase in oil price.

Key words: KASE, stock market return, macroeconomic variables, natural resource curse.

INTRODUCTION

There is an extensive literature on the influence of macroeconomic factors on stock exchange market. However, most of them have so far concentrated on developed countries. With a growing importance of emerging markets, such as Kazakhstan, there is a need for research into these particular markets.

Kazakhstan's stock exchange is less explored due to its relatively small size. After gaining the independence in 1991 from the former Soviet Union, the country has undertaken a wide range of far-reaching reforms under liberalization program: prices were liberalized, almost all small and most medium-scale enterprises were privatized, budget constraints were imposed on enterprises and banks and the earlier existing trade distortions were reduced. These measures were followed by comprehensive reforms in the banking sector.

In addition, Kazakhstan was the first in the Commonwealth of Independent States (CIS) to introduce inflation targeting as a general monetary policy in 2001. Since early 2000s, Kazakhstan's banking sector enjoyed an increased access to global financial markets, as a result, consumer and business crediting has soared. High prices for mineral products in the global markets and strong foreign direct investment (FDI) inflows, together with sound macroeconomic policies, led to a sevenfold rise in per capita income between 2000 and 2008. Consequently, Kazakhstan's stock exchange also recorded a significant rise. At the peak of the credit boom in 2006, it reached its historic record of 57 billion USD (Huseynov, 2010).

Morgan Stanley considers Kazakhstan and Ukraine as Frontier Market in CIS region. Kazakhstan is expected to become financial heart of Central Asian region. Therefore, critical review of specific Kazakh financial market

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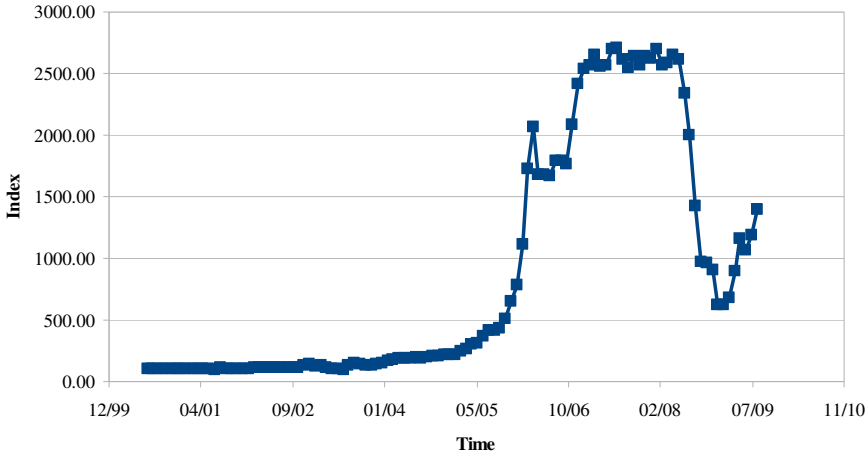

Figure 1. KASE index historical development.

is crucial, as it represents valuable experience for other countries in the region (Huseynov, 2010). In Figure 1, we describe the KASE index historical development. We detect sharp increase in the period of 2005 to 2007, following by dramatic fall in 2008. Thus, contraction and exchange rate pressure had counteracting impact on banking system activities due to bubble economy.

Indeed, global financial markets failure brought about low liquidity and reduced trade activities by retail and foreign investors Kazakhstan's stock market. Crisis in financial sector of economy took place as a result of second wave of global crisis, when major banks of Kazakhstan failed to meet international obligations and Kazakhstan had national currency depreciation followed by deteriorating quality of loan portfolios. In addition, banking system failure in turn led to business activities suspension loosing access to essential financial source from banks (EBRD, 2010).

The contributions of this research can be summarized as follows:

1.) Extends the literature by investigating complex interaction between KASE returns and macroeconomic variables including during the crisis period.
2.) Better understanding of the economic forces in an emerging stock market.
3.) Predictability of stock market implying violation of market efficiency hypothesis.
4.) ARDL bound test approach to investigate the long run relationship along with traditional methods.
5.) The first study that examines the short run and long run dynamics between stock returns and macroeconomic variables in the emerging Kazakh market.

Literature review

Early studies of the relationship between stock prices and macroeconomic variables concentrated primarily on the US stock exchanges. Most of them were guided by the arbitrage pricing theory (APT) developed by Ross (1976). Fama (1970) proposed an efficient market hypothesis (EMH) suggesting that earning abnormally high profits would be impossible due to competition among investors who follow a profit-maximizing behaviour. The EMH assumed that economic actors possess all the relevant information so that all changes in macroeconomic variables are fully reflected in stock prices. Various macroeconomic variables including inflation, money supply and exchange rate were determined as a source of stock prices changes (Fama 1981; Chen et al., 1986; Smith and Sims 1993; Hondroyiannis and Papapetrou 2001; Muradoglu et al., 2001; Fifield et al., 2000; Lovatt and Ashok 2000; Nasseh and Strauss 2000; Mayasami and Sims 2002).

Granger (1986) and Juselius (1990) attempted to define the existence of long-term equilibrium using the cointegration analysis, which, by now, has become the preferred way for studying the relationship between economic variables and stock prices.

By applying APT, Chen et al. (1986) made an attempt to use some macroeconomic variables to forecast stock returns in the US stock market. The work concluded that industrial production, changes in risk premiums and term structure were positively associated with expected stock returns. Gan et al. (2006) examined a time-series relationship between the New Zealand stock index and seven macroeconomic variables using cointegration tests. Gan et al. (2006) applied the Johansen maximum likelihood and Granger-causality tests to determine whether the New Zealand stock index reflects the changes in the analyzed macroeconomic variables. The answer was no.

Hasan and Javed (2009) explored the long-term dynamic relationship between equity prices and monetary variables in Pakistan applying multivariate cointegration analysis and Granger causality analysis. The results of

their research revealed the existence of a long-term relationship between the equity market and monetary variables, such as, money supply, treasury bill rates, foreign exchange rates and the consumer piece index.

Patra and Poshakwale (2006) examined the short-run relationship and the long-run equilibrium relationship among selected macroeconomic variables and Athens stock exchange. The empirical results of the work concluded about presence of both short-term and long-term relationship between inflation, money supply and trading volumes and the stock prices. Conversely, no relationship was found between exchange rate and stock prices.

Cook (2007) considered the threshold adjustment in the relationship between financial and macroeconomic variables. The work disclosed previously undetected asymmetry in the long-run relationship between the stock market and economic activity by applying momentum threshold autoregressive cointegration testing.

Liu and Shrestha (2008) investigated the relationship between the Chinese stock market indices and a set of macroeconomic variables, including money supply, industrial production, inflation, exchange rate and interest rates. They discovered the evidence of cointegration relationships between stock prices and macroeconomic variables. Additionally, macroeconomic situation was found to be positively influenced by long-run stock-market performance.

Mukherjee and Naka (1995) employed vector error-correction model (VECM) to examine relationship between the Japanese stock market and several macroeconomic variables. They found a positive relationship between share price and money supply accompanied by exchange rate and industrial production.

Data

We use monthly data for the period of January 2001 to August 2009, consisting of monthly average Kazakh stock exchange index (KASE), index of industrial production (IIP) as a proxy for income per capita, domestic currency rate in terms of U.S. dollar (ER), money supply (M2), volume of trade on Kazakh stock exchange (VT), long-term bank loans (LR), short-term bank loans (SR), consumer price index (CPI). The last variable emploeyd in study, oil price uncertainty or volatility measure (OIL_VOL), is estimated using GARCH methodology. KASE is obtained from Kazakh stock exchange database, IIP from *RAKURS* research center for economic analysis, crude oil price per barrel from World oil price statistics database at www.thisismoney.co.uk_, and all other data from National Bank of Kazakhstan database. Although monthly data are used rather than quarterly and yearly to avoid spurios correlation problem, we use monthly data because of the data availability constraint. In addition, Kazakhstan has undergone financial liberalization program following exchange rate floating system regime introduction in 1999 (Oskenbayev, 2001).

METHODOLOGY

The majority of macroeconomic variables are found to be non-stationary. Therefore, estimation results from running regression models would imply obtaining spirious relationships. Cointegration analysis could be applied to avoid dubious regression results. Engel and Granger (1987) two-step procedure is employed for testing the null of no-cointegration. As an alternative, Johansen and Juselius (1990) maximum likelihood test approach is broadly examined.

In this paper we use autoregressive distributed lag (ARDL) bound test approach which has been suggested by Pesaran and Shin (1999) and Pesaran (2001). In contrast with previous methodologies, ARDL approach has an advantage in a sense that it relaxes a restrictive assumption that all variables must be integrated of order one, that is I(1) variable. In fact, ARDL method allows some variables to be integrated of purely order 1, and some of order 0 or mutually cointegrated. Thus, under uncertainty condition of variable characteristics, ARDL method may be most suitable. Moreover, the estimates of ARDL approach are unbiased and efficient. It also has the following advantages: (a) method is powerful even for small sample size investigations; (b) it helps to estimate long-run and short-run relationship models; (c) it determines causality and explanatory and explained variables.

Cointegration test

The stationarity of series is examined using both Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The results of testing integration order, employing ADF test, are reported in Table 1. For the sake of saving the space, we here show only ADF test results. The results of the ADF test do not show clear picture of series cointegration. The complex mixture of I(0) and I(1) variables imply that we need to explore further to find evidence for long-run relationship between the series. For this purpose, the paper adopts the ARDL bound test approach. In fact, ARDL methodology does not require pre-testing series stationarity, which means that there is no need for ADF and PP test results. However we still examine ADF and PP tests to clarify whether we can use ARDL methodology or not. ARDL approach aims to estimate unrestricted conditional error correction model, to find whether cointegration exists or not, as follows:

$$\Delta KASE_t = \alpha_0 + \sum_{p=1}^{n}\beta_{1,p}\Delta KASE_{t-p} + \sum_{p=0}^{n}\beta_{2,p}\Delta IIP_{t-p} + \sum_{p=0}^{n}\beta_{3,p}\Delta ER_{t-p} + \sum_{p=0}^{n}\beta_{4,p}\Delta M2_{t-p} + \sum_{p=0}^{n}\beta_{5,p}\Delta VT_{t-p} +$$
$$\sum_{p=0}^{n}\beta_{6,p}\Delta LR_{t-p} + \sum_{p=0}^{n}\beta_{7,p}\Delta SR_{t-p} + \sum_{p=0}^{n}\beta_{8,p}\Delta CPI_{t-p} + \sum_{p=0}^{n}\beta_{9,p}\Delta OIL\_VOL_{t-p} + \gamma_1 KASE_{t-1} + \gamma_2 IIP_{t-1} +$$
$$\gamma_3 ER_{t-1} + \gamma_4 M2_{t-1} + \gamma_5 VT_{t-1} + \gamma_6 LR_{t-1} + \gamma_7 SR_{t-1} + \gamma_8 CPI_{t-1} + \gamma_9 OIL\_VOL_{t-1} + \varepsilon_t \quad (1)$$

Table 1. Augmented Dickey-Fuller unit root test.

Variables	ADF t-statistics (Level)		ADF t-statistics (First difference)		Likely degree of integration
	Without tend	With trend	Without tend	With trend	
KASE	-1.37(1)	-1.95(1)	-5.52(0)***	-5.49(0)***	I(1)
IIP	-2.88(11)*	-3.49(11)**	-14.20(10)***	-14.13(10)***	I(0)
ER	-1.46(1)	-1.05(1)	-7.14(0)***	-7.22(0)***	I(1)
M2	1.83(0)	-1.62(0)	-10.35(0)***	-11.01(0)***	I(1)
VT	-2.24(0)	-3.16(0)*	-11.16(0)***	-11.11(0)***	I(0)
LR	0.32(2)	-1.88(2)	-3.32(1)**	-3.51(1)**	I(1)
SR	-0.48(0)	-1.18(0)	-9.92(0)***	-9.87(0)***	I(1)
CPI	-5.14(1)***	-5.35 (0)***	-9.00(0)***	-8.95(0)***	I(0)
OIL_VOL	-3.46(1)**	-3.46(1)**	-6.11(2)***	-6.09(2)***	I(0)

Numbers in brackets are the duration of delays determined according to Schwarz information criterion (Maximum lags 12). * Implies 10% level significance,** implies 5% level significance, *** implies 1% level significance.

Table 2. F-statistic of cointegration relationship.

Test statistic	Value	Lag	Significance level (%)	Bound critical values* (Restricted intercept and no trend)	Bound critical values* (Unrestricted intercept and restricted trend)	
				I(0)	I(1)	I(0)	I(1)
F-test	3.21	1	1	2.50	3.68	2.79	3.93
			5	2.04	3.08	2.3	3.33
			10	1.80	2.80	2.05	3.02

Note: Based on Pesaran and Shin (1999).

Afterwards, we use F-test to examine the long-run relationship existence. The null hypothesis for cointegration amongst variables in unrestricted error correction model is previously shown:

$$H_0 : \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7 = \gamma_8 = \gamma_9 = 0$$

A significant F-test implies the cointegration relationship. The results of ARDL bound test approach are reported in Table 2. They indicate that there is no cointegration, that is, the null hypothesis is rejected. Thus, there is indeed long-run relationship amongst the series.

In many previous studies, the distributed lag order of the dependent variable and the regressors is selected using either the Akaike information criterion (AIC) or the Schwartz Bayesian criterion (SBC). However, according to the Monte Carlo evidence, Pesaran and Smith (1998) find that SBC is more preferred, as it is a parsimonious model that selects the smallest possible lag length, while AIC selects the maximum relevant lag length. Thus, we will use SBC as a lag selection criterion.

Long-run relationship test

Now that the long-run relationship between the series has been tested by ARDL bound test approach, Engel-Granger two-step procedure is examined to confirm this relationship. The proposed methodology suggest that the linear combination of variables is integrated of order zero, implying cointegration. The procedure involves recovering residuals, further called ECT (error correction term), from simple OLS regression. Both ADF and PP tests are performed and the results of the ADF with intercept only show that ECT is stationary implying cointegration. The results of Error-correction model based on Engel-Granger procedure are given in the Table 3.

It is evident from the Table 3 that ECT term has negative sign and significant at 5% level. The ECT is equal to -0.106 which is relatively small implying that even though there is adjustment to the equilibrium, it is rather slow as the only 10.6% of the equilibrium has been corrected. Concerning the short-run, the only variable that appears to be significant is lagged short term bank loan with negative sign, indicating hot money phenomenon occurrence in Kazakhstan deteriorates the economy and stock exchange index afterwards. It is interesting to note that Granger causality test (Table 4) produce the same results for short-run dynamics of macroeconomic variables impact on stock exchange index.

We can observe from the Table 4 that all variables are insignificant confirming the Engel-Granger model, that is, the studied variables are not good predictors in the short-run. Here, the short-term bank loans are the only variable showing significance at 10% significance level. All in all, short-term bank loans leading to asset bubbles are deteriorating the economic conditions in Kazakhstan. In

Table 3. Error-correction model.

Explanatory variables	Coefficients	t-Stat.
C	-15.086	-0.85
ECT(-1)	-0.106**	-2.15
DKASE(-1)	0.542***	5.27
DIIP	-0.124	-0.06
DIIP(-1)	0.038	0.02
DER	-6.45	-0.7
DER(-1)	0.178	0.02
DM2	0.00003	0.21
DM2(-1)	-0.00001	-0.07
DVT	0.018	1.22
DVT(-1)	-0.004	-0.27
DLR	0.0002	0.72
DLR(-1)	0.0003	0.86
DSR	0.00005	0.11
DSR(-1)	-0.001**	-2.62
DCPI	22.878	0.69
DCPI(-1)	23.667	0.75
DOIL_VOL	0.029	1.23
DOIL_VOL(-1)	-0.016	-0.66
Diagnostic test		
F-statistics (p-values in parenthesis)		
Breusch-Godfrey serial correlation LM test	0.882 (0.35)	
ARCH LM test	0.92 (0.34)	
Jarque Bera test	153.16 (0.00)	
White heteroscedasticity test	2.77 (0.00017)	
Ramsey reset test		
Adj. R-squared	0.29	
F-value	3.62 (0.00)	

*** Implies 10% level of significance,** implies 5% level of significance.

Table 4. Granger causality test.

Null hypothesis (H_0)	F-statistics	Decision
ΔIIP does not granger causeΔKASE	0.022	H_0 is not rejected
ΔER does not granger causeΔKASE	0.116	H_0 is not rejected
ΔM2 does not granger causeΔKASE	1.182	H_0 is not rejected
ΔVT does not granger causeΔKASE	2.266	H_0 is not rejected
ΔLR does not granger causeΔKASE	1.165	Ho is not rejected
ΔSR does not granger causeΔKASE	2.91*	Reject H_0
ΔCPI does not granger causeΔKASE	0.59	Ho is not rejected
ΔOIL_VOL does not granger cause ΔKASE	0.737	Ho is not rejected

* implies 10% significance level.

fact, a lion's share of KASE stock is owned by the banking system and the National Bank of Kazakhstan.

Employing the Engel-Granger methodology, we detect a strong long-run relationship between variables. Moreover, the results of Engel-Granger methodology have been confirmed by Granger causality test, proving the validity of the tools applied.

Following Johansen and Juselius (1990) our estimates show that macroeconomic variables considered are cointegrated with KASE index. In Table 5, we represent the implied long-run relationship among macroeconomic variables and the stock exchange index. First 6 trace and

Table 5. Cointegration results.

	r=0	r≤1	r≤2	r≤3	r≤4	r≤5	r≤6	r≤7	r≤8
Trace statistics	438.21*	322.90*	223.79*	161.19*	111.94*	70.31*	36.36*	11.79	1.04
Maximum eigenvalue statistics	115.32*	99.11*	62.61*	49.24*	41.63*	33.95*	24.57**	10.75	1.04

* Implies 1% level of significance,** implies 5% level of significance.

Table 6. Estimated long-run coefficients using ARDL method.

ARDL model excluding dummy variable for crisis		ARDL model including dummy variable for crisis	
Explanatory variables	**Coefficients (t-statistic)**	**Explanatory variables**	**Coefficients (t-statistic)**
IIP	465.2375 (9.23***)	*IIP*	182.37 (4.03***)
ER	-66.50169 (2.50**)	*ER*	0.84 (0.08)
M2	-0.001835 (1.5)	*M2*	0.001 (1.82)
VT	1.270006 (7.96***)	*VT*	0.33 (3.84***)
LR	-0.000441 (0.67)	*LR*	-0.0005 (1.47)
SR	0.006142 (1.93)	*SR*	-0.001 (1.14)
CPI	-2855.734 (7.10***)	*CPI*	-184.69 (3.98***)
OIL_VOL	-0.603757 (4.37***)	*OIL_VOL*	0.22 (3.46***)
		Crisis dummy	-2324.04 (3.33***)

*** - 1% significance level, ** - 5% significance level.

maximum Eigen value statistic are significant at 1 and 5% level. Here the null hypothesis is that there is no cointegration. Both trace and maximum Eigen value statistic support the existence of 7 cointegrating vectors.

As the primary goal of the research to study the long-run relationship, the ARDL model is applied. The long-run relationship results are reported in Table 6 which presents two models including and excluding a dummy variable for that takes the value of one if it is period after July 2008 and zero otherwise. The dummy variable captures the impact of the crisis which started in Kazakhstan's stock exchange in July of 2008 (Golovnin et al., 2010). All coefficients signs and magnitudes are consistent with the theoretical background. Index of industrial production (IIP), exchange rate (ER), volume of trade in stock market – REPO operations (VT), consumer price index (CPI), oil price uncertainty measurement (OIL_VOL) are significant at 1 and 5% level. Both cases, either with or without the dummy variable, inflation rate has negative impact. In fact, high inflation in this country lead to tightening of the monetary policies followed by increased interest rates and, as a consequence, negatively affected the stock prices. Concerning the effect of exchange rate, it has negative impact in a model omitting dummy variable. Its implied effect on stock price theoretically could be either negative or positive implying the question is truly empirical one. Evidently, as a major part of the KASE consists of the oil industry and banking system, the large fluctuations of exchange rates (devaluation of its currency against dollar) implies loss for these firms and banks. For instance, most banks faced mismatch between their assets and liabilities after Tenge (currency of Kazakhstan) devaluation in 2008.

However, interesting to note that significant impact of exchange rate disappears and uncertainty measure sign becomes positive preserving its significance in model with crisis dummy variable. We confer from the model that the implied negative effect of the exchange rate is captured by the crisis dummy variable and has been offset by oil price increase. Thus, negative effect of exchange rate is balanced by oil price increase as Kazakhstan is one of the major oil producing countries in the world, at least during the crisis periods. Rapid growth in capital formation in Kazakhstan is boosted by rapid increases in oil revenue – "windfall gains."

So here's my prediction: You tell me the price of oil, and I'll tell you what kind of Russia you'll have. If the price stays at $60 a barrel, it's going to be more like Venezuela,.. If the price falls to $15 a barrel, it could become more like America... with too little money to avoid developing the leaders and institutions to nurture the brainpower of its younger generation (Friedman, 2007).

Indeed the oil exports generated the so-called "windfall gains" as a result of increased oil price between 2003 and 2008. As a matter of fact, in 2008, it exceeded its record price level set in 1980's, reaching almost $147 per barrel. Nevertheless, as of July 2009, there was a sharp decrease in oil price, negatively influencing the economy

and financial system (EIA, 2009).

SUMMARY AND CONCLUSIONS

We investigated long-run and short-run relationships between major macroeconomic variables and Kazakhstan stock exchange index – KASE for the period of 2001 to 2009. The studied macroeconomic variables consist of index of industrial production, inflation rate, exchange rate, long and short-term bank loans, oil price volatility and volume of trade. We use a new methodology – cointegration technique within ARDL framework, which has not been previously employed in this area. We find the evidence of long and short-run relationships between the macroeconomic variables and stock index. The relationship equilibrium is confirmed by traditional methods such as Engel-Granger two-step procedure, Johansen and Juselius Cointegration method and Granger causality test. However, we have established a short-run relationship between KASE index and short-term bank loans only using both Granger Causality test and Engel-Granger procedure. The results of all the methods are consistent with each other.

The results of the study are consistent with the theory and introducing new dummy variable to capture the crisis impact demonstrates the practical evidence for KASE evolution. In addition, the long-run relationship of KASE index with macroeconomic variables shows the evidence of informational inefficiency of KASE.

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