Development of world coal market during the financial crisis of 2008 – 2010[1]

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Abstract
Financial crises have a large impact on financial markets and consequently often spill over into the real economy. Individual sectors of the financial markets and the economy, however, are not affected equally. This article analyzes the impact of the global financial crisis of 2008-2010 on the world coal market. Coal is the energy commodity, which does not dominate the world economy as oil, but its task in electricity generation and steel production is indispensable. The text examines the prices of coal before and during the crisis and identifies the main factors that influence the price of coal. Analyzes and compares the similar and different elements in developments of the coal market and financial markets, which are represented by stock indexes. Markets and prices of coal used to be relatively stable due to long-term contracts, the manner and extent of trading. Developments in world markets and the financial crisis in 2008, however, caused growth of volatility on commodity markets. Since 2007, prices rose gradually and significantly, and consequently, due to the crisis, they also faced a sharp decline. In 2010, thanks to growing demand in Asia, prices of commodities including coal have started to grow again. The world coal market is imperfect and heterogenous, which is mainly due to geographical distribution, different forms of coal, government regulations, way of trading and significant transport costs.

Keywords: financial crisis, coal, commodity market
JEL codes: E32, F14, Q31, Q41

1. Introduction

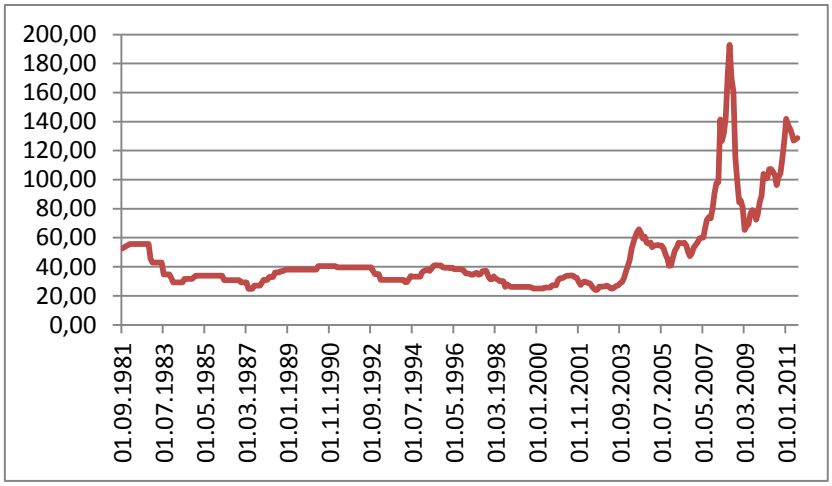
The recent global financial crisis in 2008 hit the financial markets as well as commodity markets significantly leaving market participants uncertain of how serious and how long the impacts would be present and how far prices could fall. The uncertainty of market fundamentals affected by far international trade and rising investment costs caused many investment projects to be postponed or cancelled.

The aim of this paper is to identify the effects of global financial crisis of 2008-2010 on the world coal market and explain a role of specific factors that influence the market using the data of Australian thermal coal price development. The Australian thermal coal was chosen as an agent of internationally traded commodity from the country that is the world's largest exporter. The main question is what has happened to a coal market that used to be stable and predictable for decades.

During the last decade, the price of thermal coal has risen, on average, from 30 USD per tonne in 2001 up to 200 USD in 2008 and then fell back to 65 USD and recovered back to 130 USD per tonne in September 2011 as it is shown in Figure 1 (Australian thermal coal, 12000- btu/pound, less than 1% sulfur, 14% ash, FOB Newcastle/Port Kembla).

Figure 1: Price of Australian thermal coal (in US Dollars per Metric Ton)

[1] The research behind this paper is supported by Grant Agency of the Czech Republic within a project no. 403/11/2073.



Source: Index Mundi (2011)

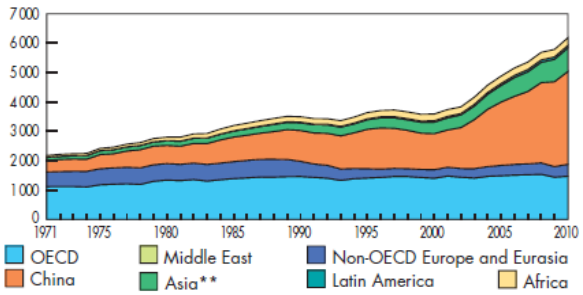
This analysis is based on data of International Energy Agency (IEA), Index Mundi and Australian Bureau of Agricultural and Research Economics (ABARE) and sources of cited literature.

1.1 Coal market and its characteristics

A coal is the traditional energy commodity primarily used for power generation for centuries. Despite its negative environmental effects and growing competition from other non-renewable (such as oil and gas) and renewable (hydro, wind and solar) sources of energy it remains indispensable not only in power generation but also in steel or cement making process. The main reasons for such position in world economy are following.

The world's coal reserves are significantly larger and more widely dispersed than other energy commodities such as oil or gas. Coal is safe and easy to transport, and it can be easily stored. Reflecting these attributes, as well as the reserves base of developing economies including China and India, coal is a primary source of energy for electricity generation.

Figure 2: Hard coal production by region (in Mt)



Source: International Energy Agency, Key World Energy Statistics 2011

Due to its unique chemical composition and energetic value the coal became input for many industrial processes. Reserves of coal are distributed all over the world. The Largest reserves and mining activity are in the U.S.A., Russia, China, Australia, India and many other countries. Most of the mined coal is used locally and only a small part is traded internationally. Major coal exporters are by far Australia, Indonesia and Russia and importers Japan, China, South Korea and recently India. Transport costs contribute significantly to total cost of coal and therefore prices are different according to place where the coal is traded and delivered. Due to varying chemical composition we can distinguish different categories of coal such as lignite, hard coal and anthracite or according to usage as thermal (steam) coal and metallurgical (coking, steel) coal. A metallurgical coal is often blended of various types of coal and thus different categories (brands) exist at market and that creates opportunities for profit for buyers as well as for sellers.

From the facts mentioned above we can argue that coal market is rather heterogenous.

2. Demand and supply factors at coal markets

Economic development is a key factor in market for energy resources. As the economy grows there is a growing consumption of energy sources, with the economic decline the consumption and thus demand decreases. This relationship is useful, for many reasons, to analyze and describe in more detail. Demand and supply of coal determine the market price, both sides being affected by various factors. Most of them are generally known and widely discussed and tested as for example Zhihua et al. (2010) established a verification model of coal price using cointegration analysis method and performed an empirical study on the corresponding statistics from the year 1985 to 2008. It showed that the main factors affecting coal prices are the output value of industry, GNP, retail price index, coal cost and coal supply. The world coal market has its own characteristics and the factors affecting the market are developing so it is desirable to identify these factors because some of them were strongly influenced by the financial crisis.

2.1 Demand side factors

Coal demand is highly dependent on energy demand, as the majority of power generation in several countries (such as China, India and South Africa) comes from coal generation. In addition, the single largest proportion of world-wide power generation comes from coal generation.

Significant demand from China and India is increasingly accounting for the bulk of worldwide coal usage. Hence, coal demand and consequently coal prices will depend on the strength of the Economic recovery in the emerging markets, particularly China and India as mentioned.

Also coal, as an energy commodity can be substituted by other fuels. If other forms of power-generation such as gas or oil become expensive, this will increase the demand for coal as an alternative form of energy generation.

Weather is affecting the demand when the volatility of temperature increases and thus the consumption varies especially during the winter time.

As several of the coal commodity currencies (Australian Dollar, South African Rand and the Columbian Peso) have floating exchange rates, any appreciation in the value of these currencies consequently increases the price for holders of non-commodity currencies. As price increases, obviously demand will fall, depending on how elastic demand is. Therefore, it will be macro-economic factors such as GDP, trade deficit, national debt, inflation, interest rates that can indirectly influence the price of coal. Also AUD is quite a popular currency for the carry trade, so the rate of the AUD will be dependent on how popular it remains as a carry trade currency, which in part will depend on the whether interest rates remain high in Australia and low in the U.S.A. and Japan, thereby increasing the popularity of the USD/AUD and JPY/AUD carry trade pairs etc.

2.2 Supply Side factors

Even though coal is a non-renewable resource, supply is not a problem in the medium term as global reserves are still large, and technologies for the extraction and utilisation of coal are improving. Given the large resources the coal industry can experience overcapacity problems in the future if new mines are open and it may cause decreases in coal prices.

Important factors affecting by far the supply change are the lags in investment to new mining projects.

A major factor are costs of transport (mostly shipping in case of Australian coal) and thus weather and all the other natural forces linked with physical trading.

Mining operations are dependant on reliable supplies of mining equipment, replacement parts, explosives, diesel fuel, tires, magnetite and steel-related products. If the cost of any mining equipment or key supplies increases significantly, or if they should become unavailable due to higher industry-wide demand or less production by suppliers, there could be an upward impact on coal prices and this increase in coal price may affect consumer's purchasing tendency.

2.3 Other factors affecting price of coal

Among many known factors some are more significant and have impact upon both demand and supply such as following. Government regulations on coal trade may affect coal prices and change the balance of demand and supply. Operational risks of coal mining beyond human-being control, including weather and geological conditions or catastrophic weather can cause price changes or disability to mine and deliver coal. Environmental concerns related to coal mining and combustion and the cost and perceived benefits of alternative sources of energy such as natural gas and nuclear energy have the growing power to change the whole miming industry.

For instance the world's second largest producer of anthracite coal, Vietnam, announced earlier this year that it was raising tax on coal exports to 20 per cent from 15 per cent. As well, it would gradually cut coal exports to three million tonnes per year by 2015 from 16.5 million tonnes this year, while raising imports to six million tonnes of coal per year by 2015.

China extends from November 2011 regional tax on domestic sales of oil and gas at the national level and will introduce it to the coking coal and precious metals. Its purpose is to save domestic raw material resources and to raise money for poor regions and to reduce the high profits of state mining companies.

2.4 Relationship between price of coal and oil

There is some relationship between oil and coal, although it has never been fully proven. Oil prices have been increasing throughout the year but it's not necessary that the coal prices would also move with them. Coal prices have their own dynamics and an analyst should therefore take into consideration both sides of a coin in order to study the correlation between coal and oil prices.

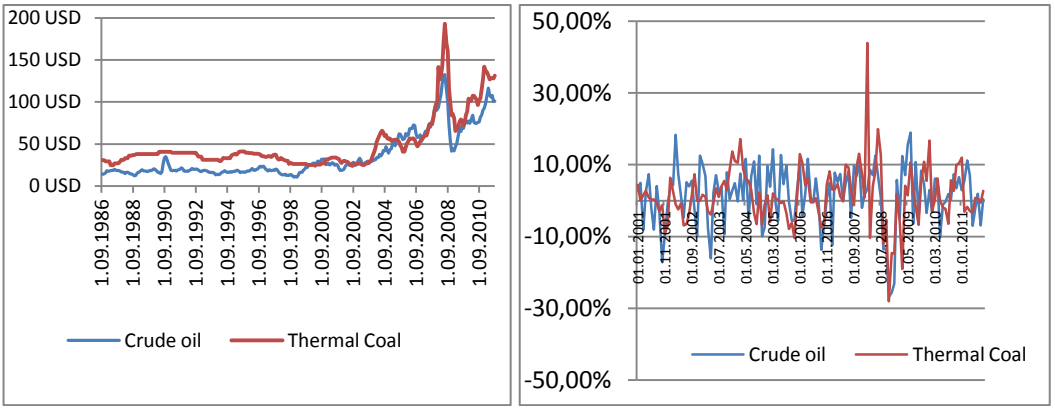
Despite this wavering nature of coal prices, some conclusions could be drawn. The coal traders normally adjust coal prices with respect to oil, as oil price fluctuation is one of the best indicators of investor attitude towards energy. This adjustment is very quick so even if instantly there is a hike in the oil price, coal will tend to follow, but if there is no fundamental increase in coal demand, then the price of coal will not increase even if oil prices continue to rise. This draws our attention to the fact that coal prices not only depend on the oil prices but also on its own demand and supply fundamentals, which are not really related to oil in any manner. For example the political instability that dominate the oil markets such as any new concerns about geopolitical uncertainty in countries like Libya make crude oil prices shoot but this however, has not caused a stable rise in coal prices which have not reflected these concerns.

In the same way this negative relationship could also be seen with regards to the floods in Queensland, Australia, which disrupted the world's largest supply of thermal coal, sending prices sky high but had a little impact on the price of crude oil. Moreover, as far as demand and supply fundamentals are concerned China and India are major consumers of energy-producing coal and are responsible for major increases in coal prices independent of crude oil.

Even the inconsistent demand from China for coal imports are another factor that can cause major movements, both positive and negative in global coal prices irrespective of oil prices.

Besides the discussion above about negative correlation, there has also been a positive correlation between coal and oil prices. Though in some years the percentage change in coal price does not seem consistent with that of oil, during the crisis, they stick together and increased significantly and then fell down as shown below.

Figure 3: Development in prices of coal and crude oil (in USD) and mothly price changes (in %)



Source: Author's calculation

3. Development of world coal market during the global financial crisis

Coal prices over the last decade illustrate different story when compared with the previous 25 years. Since 2001 the market has changed significantly due to a variety of factors such as regulatory restrictions and reserve depletion that have led to significant supply inelasticity and greatly increased price volatility. In fact, coal prices soared by 200% in 2001 and in 2008 prompt coal prices spiked nearly 300%.

The Figure 1 shows stable price for more than 20 years up to 2004 when the price rose by nearly 40 percents during a few months and then again dramatically in 2007-2008 just before the outbreak of financial crisis.

The economic crisis hit the market significantly in 2009. Production fell even more than sales.

The most affected area was the production and sale of coking coal and coke, that was caused by a large slowdown in metallurgy and steel industry in the world. Thermal coal in 2009, on the contrary proved to be a stabilizing factor.

3.1 Impact of global financial crisis on transport costs

A coal is transported mostly by rail and sea and the cost of the transport creates significant part of final price for consumers. Majority of internationally traded coal is delivered by shipping it from exporting countries (Australia, Indonesia and South Africa) to importing countries (Japan, China etc.) During the global financial crisis the sharp drop in global shipping and freight rates had occured. Iron ore, coal and grain are the key commodities transported by dry bulk vessels. As Rademacher and Braun (2011) show the three markets experienced fall in demand leading to a decline in overall dry bulk demand of an estimated −3% in 2009, while the capacity of dry bulk carriers rose by +10%. The oversupply in the freight market led to a collapse in spot freight rates by as much as 75% from 2007/2008 peak levels. At the peak in 2008, actual freight costs from Richards Bay (South Africa) to Rotterdam made up 20–30% of the CIF delivered prices. In the forward market at the end of 2010, the ratio of freight prices as a proportion of the coal price in Rotterdam was only at 10% for the annual 2011–2013 forward quotations, indicating that the supply overhang in the shipping market is expected in the traded market to continue for the next several years.

3.2 Chinese transformation of the world coal market

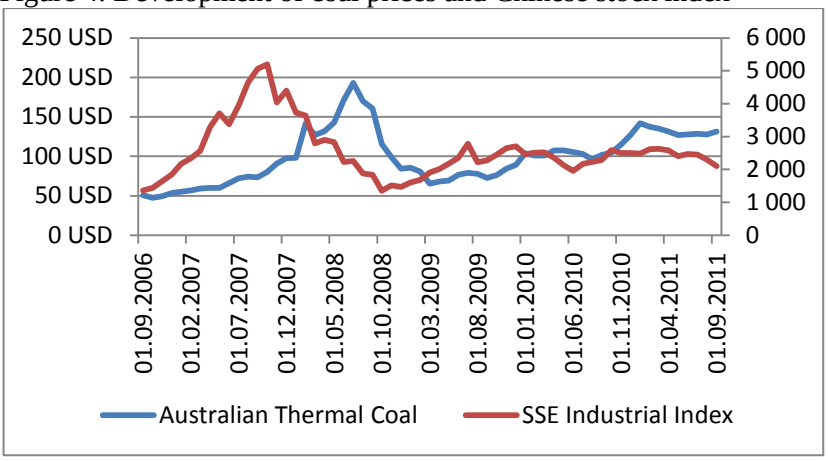
In 2009 the global coal market witnessed one of the most dramatic change ever – China, long a net exporter of coal, suddenly imported nearly 15% of all globally traded coal, only Japan imported more. Thus China became the main player of global demand as traditional import markets like Europe and Japan stagnated during the outbreak of the financial crisis. By the first quarter of 2010, even Colombia was defying established trade patterns by sending cargoes to China despite its geographic disadvantage to export coal into Asian markets. The Chinese growing demand for imported coal seems unsatisfiable, and this event sets a new paradigm for the global coal market.

This state however may not be valid for long. China is not only the world's largest coal producer (covering nearly half of world production) but also posses the third largest reserves. The reasons for Chinese imports are first of all growing prices that push coal consumers to seek cheaper supplies and when they are available abroad than to import them. The other reasons, that also affect the price, are transport cost and available capacity at Chinese domestic market. Most of Chinese coal is concentrated in the North and West of China but the final market is in Southeast China. The high cost of moving coal to the heavily industrialized coastal area and insufficient capacity enabled import coals to compete with domestic coals.

The rise of Chinese domestic coal prices was given due to several factors:

- Rapid growth of coal demand due to rising industrial production (increased demand for energy, steel, cement, fertilizers etc – areas where a coal is essential input of production). Figure 3 show an evidence of similar development of coal prices and development of price of industrial companies in China though there is long lag between them.

Figure 4: Development of coal prices and Chinese stock index



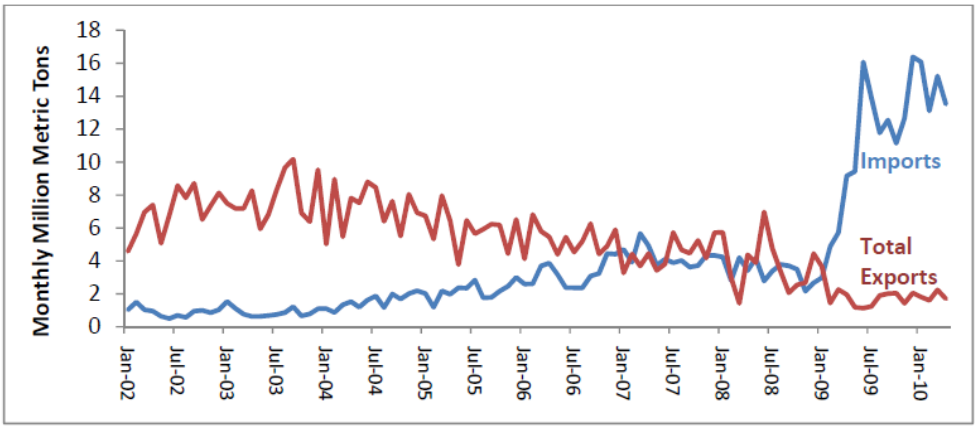
Source: Index Mundi and Shanghai Stock Exchange 2011

- New government regulations of mining that closed small mines or consolidated them into larger mines that slowed the growth of coal production.
- Implementation of more rigorous safety standards and system of paid use of coal resources and taxes on mining resulted in a substantial increase in coal production costs.
- Insufficient rail transport capacities.

Southeast China is also the closest region in China to two major global coal exporting nations, Indonesia and Australia. Another important source of coal is Russia. This arbitrage opportunity was described by Morse and He (2010) and it allows Chinese coal buyers to take advantage of price differentials between domestic Chinese coal and international coal prices. Until 2009, those differentials had not favoured imports. Free trade and possibility of an arbitrage therefore links prices of coal from China, Indonesia, Australia, Russia and the rest of the world as well because these countries are the largest world exporters.

On the contrary to Chinese situation the other world's fastest growing importer, India, is plagued by a growing gap between coal supply and power demand that it is unable to fill domestically and thus is becoming more dependent on world market and primarily on Chine as they compete for the same exports.

Figure 5: Development of Chinese foreign trade



Source: Morse and He (2010)

3.3 Development in trading and pricing the coal contracts

Coal prices were stable for long time also because most of coal was traded under long-term contracts with electric-utility companies and steelmakers. As regulations on electrical generation pricing loosened up, the need for cost efficiency forced power station buyers to become more flexible about the kind of coal they purchased. Also major mining companies (BHP, Rio Tinto, Xstrata) are changing the way of trading in favor of short term contracts or contracts with adjustable prices according to development of market price.

As a result of the price volatility during the financial crisis, price negotiations between the largest suppliers and importers especially in the Asia-Pacific region have moved in the metallurgical coal market from annual contractual agreements to quarterly pricing. This allows both sides greater price flexibility to adjust more quickly to changes in fundamental market conditions. Large suppliers are pushing for even more frequent fixing via monthly pricing and metallurgical coal indices like the coal futures in the thermal coal market.

There is now a fairly active spot and forward market for physical coal, as well as a coal swaps market that has drawn in some financial players.

New feature of world coal market during the last decade is an organised trading with derivative contracts – coal futures. Coal futures trading began in 2001 at New York Mercantile Exchange (NYMEX), in 2006 at The European Energy Exchange (EEX) and later at ICE Futures Europe, GlobalCOAL and Australian Securities Exchange (ASX) and few others mainly in the Asian-Pacific region. At the beginning of the trading at NYMEX in 2001 it was not clear whether there would be a perspective of trading coal futures because the price of coal lacked a significant volatility. As soon as the prices began to grow in 2004 the demand for futures started to rise. There are several types of coal traded depending of its geographic origin: American , Australian, South African and European coal. Despite a growing number of exchanges where coal futures are traded and growing volumes the overall organised trading is so far considerably smaller than oil futures.

Impact of the global financial crisis to organised trading is unambiguously positive. Prices of coal were fluctuating as shown in Figures 3 during that period with sudden rises and falls of nearly 100% in just one year. The demand for trading is naturally growing because of greater uncertainty of economic development and greater volatility of prices.

Another reason for growth of organised trading of is that in recent years, the coal market has experienced a high number of producer non-performance and bankruptcies issues. This fact strongly favors using the derivatives market where counterparties have a higher credit rating and the coal transacted is non-source-specific. Generic, non-specific sourcing, eliminates force majeure risks and therefore creates fewer non-performance issues in the OTC market. Although some counterparties choose to favor producer direct bilateral transactions over use of the derivatives market, direct transactions have force majeure clauses that significantly increase the potential of non-performance. The standard derivatives contract does not contain a force majeure clause; therefore, a derivatives contract provides a higher value relative to a traditional bilateral purchase with a supplier.

4. Conclusions

World economy slowed down due to the global financial crisis. Developed economies are still struggling to recover from this shock but emerging markets especially Asian and Latin American countries escaped the recession in 2009. This reflected the growing importance of their economies and a strong demand from China and rest of Asia.

Mining commodity prices have risen strongly recently before the global financial crisis then fell down and are rising again now. This appears more than a fluctuation around a long-term downward trend. That reflects the strong state of world demand, and in particular the rapid growth in China. However, the long lead times in developing mining projects mean there are lags and fluctuations at the market. As more productive capacity comes into operation around the world, commodity prices could slow or fall back somewhat. Prices of coal have started to follow more cyclical behavior with significantly increased volatility that was caused not only by the crisis but also by the other analyzed factors. One of them was volatility of transport costs due to overcapacity combined with the fall of demand. Other new feature of world coal market is the formation of organized trading with coal futures and more frequent price adjustments in long term contracts etc.

Once a largely isolated coal market, China now plays a central role in determining global trade flows and prices. Understanding Chinese import behavior under current and future market conditions is therefore imperative for any analysis of the global coal trade.

This means that the relationship between China's domestic coal price and the international coal price will be one of the key factors in determining global trade flows in the coming decade as China could just as easily buy 15-20% of internationally traded coal as it could buy very little.

China's role as world's largest coal arbitrageur has a hugely significant implication for the global coal market: it links the international price of coal to China's domestic price. The unique politics and economics of the Chinese coal market are now therefore by necessity the politics and economics of the global market, and whether or not China imports coal in a given year, "the China factor" will increasingly define how the world sells, buys, and uses coal.

The reason the coal industry can be so susceptible to the forces of nature is primarily because, more often than not, the coal needs to be hauled from remote and underdeveloped regions to large ocean bulk terminal ports for export within established seaborne trade routes.

The world coal market is imperfect and heterogenous, which is mainly due to geographical distribution, different forms of coal, government regulations, way of trading and significant transport costs. Due to the global financial crisis and other factors mentioned above instability of world coal market has grown.

We can conclude that the last decade was rather revolutionary for world coal market and that the financial crisis accelerated some processes like a creation of organized trading and integration into one global market.

References

ALAGIDEDE, P. – LANGE, I. (2009.) *Variability in Coal Prices: Evidence from the U.S.* Stirling Economics Discussion Paper 2009-01. Stirling: University of Stirling.

CARPENTER, G. (2009). The Rise of Futures in International Coal Markets – The Asian Challenge. *Inernational Coal*, Special Report.

INTERNATIONAL ENERGY AGENCY (2011). *Key World Energy Statistics*. France: International Energy Agency.

MORSE, R.K. – HE, G. (2010). *The World's Greatest Coal Arbitrage: China's Coal Import Behavior and Implications for the Global Coal Market*. FREEMAN SPOGLI INSTITUTE FOR INTERNATIONAL STUDIES Working Paper 2010-94. Stanford: Stanford University.

ZHIHUA, D. – CHAO, Z – MEIHUA, Z. (2010). Quantitative Analysis of Factors Affecting Coal Price. In *Proceedings of the Management and Service Science (MASS), 2010 International Conference on*. Wuhan, China: China University of Mining & Technology, pp. 1–4.