Namibia’s Resource Curse?

How Namibia’s diamond dependency has affected their economic growth
ABSTRACT

Empirical evidence suggests that it exist, on average, a negative relationship between resource intensity and economic growth, labelled The Resource Curse. This paper estimates the statistical relationship between diamond exports as a share of GDP and the economic growth of Namibia, a country in Sub-Saharan Africa. The underlying notion of this approach is to investigate how Namibia was able to avoid a resource curse.

Using a Vector Error Correction (VEC) methodology, we find that Namibia’s diamond abundance does not seem to have affected the country’s growth rates negatively which is contradictory to Sachs and Warner’s (1995) findings. Instead, our estimate indicates that an increase in the ratio between diamond exports and GDP would render an increase in Namibian economic growth, ceteris paribus. A discussion around Namibia’s institutional quality strengthens this view. Our findings emphasize that Namibia’s underlying resource curse was avoided by effective investments and sound institutional quality.
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1. INTRODUCTION

For a long time, primary exports were seen as the central engine to the development process and for economic growth. It was assumed that a less-developed country (LDC) ought to focus on its comparative advantage in primary exports to gain improved utilization of factors of production, expanded factor endowments and backward and forward linkage effects between sectors (Perkins, Radelet & Lindauer, 2006). However, empirical evidence suggests that it exist, on average, a negative relationship between resource intensity and economic growth, labelled The Resource Curse. This paper estimates the statistical relationship between diamond exports as a share of GDP and the economic growth of Namibia, a primary exporting country in Sub-Saharan Africa. The underlying notion of this approach is to investigate how Namibia thus was able to avoid a resource curse.

Sachs & Warner's (1995:1) influential econometric analysis found that an increase of ten percentage points in the ratio between primary exports and Gross Domestic Production (GDP) was associated with a 0.7 percentage point slower annual growth rate per capita counted as an average of 95 countries. The authors find that this holds true even after controlling for various relevant variables. In other words, countries with large primary exports tended to have slower growth rates than resource-poor countries. This somewhat paradoxical finding has, as noted, been labelled the resource curse, and is confirmed time and again by numerous cross-country regressions. In particular, it has been suggested that mineral or oil abundant countries are most likely to suffer from the resource curse (Mansoob & Murshed, 2004). Where does this so called curse, named a conundrum by Collier & Goderis (2007), stem from?

A simple explanation could be “that easy riches lead to sloth” (Sachs & Warner, 1995:12). Another highly influential idea is that it is not in having natural resource endowments per se the problem lies. Rather, what are important are institutional quality and how the resources are managed. This political economy framework could be analysed in terms of rent seeking and thereby an inefficient use of the public good of natural resources (Lane & Tornell, 1995).
An explanation within the field of economics has been labelled *The Dutch Disease*. The Netherlands, Nigeria, Saudi Arabia and Mexico have all, amongst others, been infected. The symptoms are raising inflation, declining manufacturing exports, lower rates of income growth and a rising unemployment. In brief, the Dutch disease is caused by an influx of foreign exchange which stems from a boom in primary exports. This stimulates the domestic inflation which, subsequently, renders the real exchange rate to appreciate and causes a decline in foreign demand for other goods and services (Perkins, Radelet & Lindauer, 2006).

In contradiction to the above, there is significant evidence on primary exporting countries with time-series data indicating relatively high growth rates. The Republic of Namibia is an interesting example. The young country has long ranked as a major producer and exporter of diamonds. The diamond mining contributes to about ten percent of the Namibian GDP and is seen by the government as a presumed tool for the development process (Sherbourne, 2009). At the same time, this natural resource intensity is accompanied by a relatively high GDP growth rate; the average annual growth rate between the year of the Independence, 1990, and 2007 was 3.98 percent (NPC/CBS, 2009 & authors’ calculations). Since the Independence, Namibia has only experienced negative GDP growth in one year. This was, worth noting considering the above discussion, in 1993 when diamond production was cut immensely (Sherbourne, 2009). Apparently, the Namibian diamonds indeed seem to be correlated with economic growth, though in the opposite direction suggested by the natural resource curse. However, there are theoretical reasons for investigating whether Namibia suffers from an intrinsic curse, meaning a negative relationship between diamond exports and economic growth without controlling for variables that affects these relatively high growth levels or, for instance, institutional quality. If an underlying resource curse is present it would be possible to analyse the country’s avoidance of low subsequent growth rates. Hopefully, the results could draw important lessons for the inescapable future handling of Namibia’s diamonds.

Part 2.1 gives an overview of earlier research on the resource curse, where Sachs & Warner’s groundbreaking papers serve as starting point. This paper assumes
that the Dutch disease and institutional quality are the underlying forces behind the resource curse which are also used when discussing our results. The concepts of the institutional quality and Dutch disease are briefly examined in Part 3.1 and 3.2. The rest of the paper (i.e. Part 4 to 6) follows a standard outline departing from a discussion around our data, which also gives a rather thorough overview of the Namibian economy and diamond industry. To estimate the statistical relationship, a Vector Error Correction (VEC) methodology is described in Part 5 and Appendix 3, which is suitable for single-country time-series studies and is deployed in part 6.\(^1\) Other variables such as institutional quality, savings and investments are also controlled for and are described in Part 4 together with other relevant data concerning Namibia. In Part 6 and 7, our results are in brief discussed within the framework of the resource curse.

\(^1\) See for example Deaton & Miller (1995) and Ogunleye (2008).
Motivated by the tendency for natural resource abundant economies to grow less rapidly than resource-poor economies, Sachs & Warner (1995:1) draw a cross-country regression showing that, between the base year of 1971 and 1989, countries with high ratios of natural resource exports to GDP indeed tended to have low growth rates. The findings culminated in the revised version Sachs & Warner (1995:12), which starts out from primary exports to GDP as a measure of resource dependency, assumed in this paper too. Subsequently, when controlling for initial per capita incomes, trade policy, government efficiency, investment rates and other variables among the developing countries in the study, the authors’ growth regression still found the negative relationship to hold true. However, they conclude, among the variables controlled for it seems as if only openness to trade, institutional quality and investments have a significant affect on economic growth, while, *inter alia*, inequality only have a discernible association to growth (Sachs & Warner 1995:12). Although some uncertainty about the latter finding, it is highly interesting for this study since Namibia exhibits the highest Gini coefficient in the world, counting to approximately 0.6 in 2004 (Sherbourne, 2009).

In summary, Sachs & Warner found that an increase of ten percentage points in the ratio between primary exports and GDP was associated with a 0.7 percentage point slower annual growth rate per capita (Perkins, Radelet & Lindauer, 2006), of course dependent on the variables controlled for. Intuitively, these findings illuminate questions over the *raison d’être* of natural resource abundance in itself. However, the authors say very little about appropriate policy implications and, instead, weigh the disadvantages against the presumed high welfare costs that would come from government policies promoting non-resource industries (Sachs & Warner, 1995:12). It is also the case that Malaysia and Mauritius, two resource-

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2 The basic growth regression was used by Barro & Sala-i-Martin (1995) and was further developed by Sachs & Warner (1995:1) & (1995:12).

3 In Sachs & Warner’s study, openness to trade is a dummy variable that takes the value of 1 if the country is open and 0 if not. Their criterias for openness would, probably without being to bold, render the value of 1 for Namibia between the Independence and present and are thus not suitable for a single-country study.
abundant developing countries, were found to have relatively sound growth levels exceeding two percent per annum during 1971-1992 (Sachs & Warner, 1995:12).

It is unambiguously so that the majority of studies concerning the resource curse depart from a cross-country analysis such as Sachs & Warner’s, per se not suitable for this study. However, there are interesting alternatives of single-country studies treating the resource curse: Ogunleye (2008) deploys a VEC methodology when examining the relationship between Nigeria’s huge oil wealth and the country’s poor economic development, using indicators such as GDP per capita, consumption, electricity and output growth rates for manufacturing and agriculture.

In confirmation with the resource curse hypothesis, it is established that the Nigerian oil dependency, measured as revenues, has a negative relationship to GDP growth. The methodology adapted in Ogunleye (2008) is interesting for the study of the Namibian diamond dependency since it analyse solely one country, abundant on a natural resource. However, the indicators used in the mentioned VEC model are adapted for an analysis of the association between resource abundance and economic development, while this paper investigates the relationship between resource abundance and economic growth.

In conflict with the above, Collier & Goderis (2007) discuss the tendency for cross-sectional analyses to support the curse hypothesis, while VEC:s often find resource intensity having a positive association to economic growth. The authors criticize the cross-section approach since the models do not take commodity prices into account. They also recognize the substantial risk of omitting important control variables in the analysis. On the other hand, Collier & Goderis dismiss the VEC methodology as incapable of addressing long-run effects. However, since this study measures the effect on growth from diamond exports between the years of 1993 and 2007, it is a relatively short period; the mentioned problems associated with the VEC model could hence be dismissed. Furthermore, Ogunleye (2008) indeed finds a negative relationship between resource abundance and economic growth, although using the VEC framework. Therefore, we will follow Ogunleye’s (2008) econometric methodology to analyze a statistical relationship as mentioned above, but with variables that suit our specific analysis.
2. CAUSES BEHIND THE RESOURCE CURSE

2.1 Institutional Quality

Ross (1997) gives, apart from a thorough overview of economical standpoints such as the Dutch disease, an enlightened summary of the political explanations behind the resource curse, by sorting the theories into three subgroups:

i) Cognitive, meaning that resource windfalls create “myopic disorders among policymakers”, or, in other words, an ad hoc mentality.

ii) Societal, meaning that some private actors in a society might profit from growth-impeding policies, such as import-substituting industrialization instead of export-promotion. In turn, resource wealth could alter this behaviour.

iii) State-centred, meaning a rentier state that receives most revenues externally from, for example, resource-rich soils. Thus, the government “are freed from the need to levy domestic taxes and become[s] less accountable to the societies they govern.” Instead of promoting development, the rentier state is unrealistically optimistic about the future.

It suffices to mention the political economy framework Ross (1997), since it has been highly influential and that the economy – in terms of exports, inflation, exchange rate, taxes, current account etcetera – are by no means something that are not influenced by different physical actors in the economy, thoroughly explained by the author. Accordingly, it has been confirmed that natural resource abundance leads to rent-seeking behaviour (IMF, 2009). It is also argued that the abundance is an important determinant of a country’s level of corruption. Ross (1997) thus emphasizes institutional quality as “the doer behind the deed”, as opposed to explanations within more-quantitative fields such as economics.

2.2 The Dutch Disease

The phenomenon of the Dutch disease is named after the appreciated guilder and weakened competitiveness of the Dutch economy as a consequence of huge
revenues from newfound gas in the North Sea in 1959. It has been emphasised by several authors, including Sachs & Warner, as one of the major forces behind the resource curse. Ogunleye (2008) straightforwardly describes the Dutch disease as:

...the tendency for the real exchange rate to become overly appreciated in response to large capital inflows, resulting in a shrinking of non-resource export sectors, often manufacturing.

More specific, an export boom or capital inflows creates accumulated reserves and rising money supply, which subsequently moves the economy into inflation caused by a rise in nontradable prices. This is constituted by a limited supply of nontradables that, together with a general rise in domestic demand stemming from the boom, result in higher prices for these commodities and services and thus cause inflation to rise. Consequently, the rise in nontradable prices gives an appreciated real exchange rate and hence renders other exports to be less competitive and profitable (Perkins, Radelet & Lindauer, 2006). In summary, the disease starts out from (1) a boom in primary exports causing an appreciation of the real exchange rate which, in turn, (2) affects other industries negatively.

The Dutch disease could also be viewed from a labour force perspective, where large endowments of natural resources affect the distribution of employment in the economy. In this context, a boom in the specific resource would render an employment decrease in, most commonly assumed, the manufacturing sector. The label “disease” stems from this shrinkage of the manufacturing sector (Sachs & Warner, 1995:12).

However, as noted by Perkins et al. (2006), “the negative relationship between primary product exports and economic growth is a tendency, not an absolute straightjacket”. In other words, there are ways for the government to avoid the Dutch disease. Apart from monetary policies, the core object is to channel investments into sustained development so to make use of resource windfalls in a way that opens up economic opportunities outside the primary sector. This stand could be looked upon as a countercyclical measure where investments stimulate the economy after the boom has faded.
The underlying notion of investments as stabilizer and stimulator departs from growth models such as the Harrod-Domar framework and the Solow model. Both models assume that capital accumulation created by investments determines a country’s growth levels. In turn, the investments depend on their productivity, interpreted as the ratio between capital and productivity. In the Harrod-Domar model, productive investments thus lead to economic growth, while Solow argued that higher saving rates lead to more investments, which temporarily increase GDP growth (Perkins, Radelet & Lindauer, 2006). If this growth subsequently renders economic development and opportunities for, say, the manufacturing sector, the Dutch disease may be avoided.
3. ECONOMETRIC METHODOLOGY

To analyze how Namibia’s diamond abundance affects the country’s economic growth we will present the econometric methodology for VEC models, in the following order: First, a VEC is derived from a Vector Autoregressive (VAR) model which tests the order of integration and the stationeries, a unit root test, for our variables of interest. Secondly, we test the variables for co-integration, which is interpreted as the establishment of a long-run equilibrium relationship between our time-series. The third and final step is to estimate the VEC model from the mentioned estimations. For a more detailed explanation about the underlying methodology, see Appendix 3.

The classical econometric theory is predicated on the assumption that observed data comes from a stationary process, a process whose variances and means are constant over time. Conversely, most of the economic variables grow and change over time. Therefore, by running a regression analysis with the assumption that there are only stationary variables might result in a counterfeit analysis (Nelson & Plosser, 1982). To avoid this we will use a more advanced analytical method, the VEC model (Ogunleye, 2008).
4. DATA

4.1 Economic Growth and the Diamond Industry

The dependent variable in the econometric model is economic growth which is based on data from the National Planning Commission/Central Bureau of Statistics (NPC/CBS). The Namibian growth record has been quite remarkable considering the country being a small open economy, heavily dependent on international commodity markets and prices (see Graph 1 in Appendix 1). One factor that probably accrues to the Namibian GDP percentage growth since the Independence is a restructuring towards a more-diversified economy with lesser contributions to GDP (about one third) by agriculture, mining and government, comparing 1990 to 2007 (Sherbourne, 2009). Hence, when describing the Namibian economy of today, one should not omit aspiring sectors such as tourism and manufacturing. The World Bank (2009), on the other hand, considers that the Namibian economic successes “rest on a strong multiparty parliamentary democracy that delivers good economic management, good governance, basic civic freedoms, and respect for human rights.” High governmental expenditure on education and health is given notable remarks by the Bank and is referred to as examples of a prudent public policy. Unfortunately, the growth rate for 2009 is forecasted to between -0.4 percent and -1.6 percent, turning this positive trend on its head (Windhoek Observer, 090502).

Diamond exports are subsequently assumed to affect these growth levels; the idea is to ascertain in what way the statistical relationship works. The diamond export statistics are also provided by NPC/CBS. Unfortunately, the numbers only goes back to 1993. By consequence, our analysis starts out from that year until 2007. Diamond exports are constituted as shares of GDP as annual measures of resource abundance, after the stance taken by Sachs & Warner (1995:12).

Namibia’s diamond exports contributed to about 13.3 percent of GDP in 2007 (NPC/CBS, 2009), giving promise of prosperous futures. More specific, the annual
production of gem quality diamonds⁴ has an approximate value of US$ 450 million. Thus, counting by value, Namibia is the sixth largest producer of diamonds in the world with only Botswana, Russia, South Africa, Angola and Canada producing more (Boer & Sherbourne, 2004).

Since the Independence, it has been readily seen by the Namibian government that further cutting and polishing of rough diamonds is a pathway to job creation and export boosting. Furthermore, the desire has been that these activities should take place on a local, widespread level. “Namibia’s diamond dream” could probably foremost be looked upon as a major revenue source for the government (Sherbourne, 2009). As opposed to general corporation taxation, diamond-mining companies pay 55 percent of taxable income and ten percent in royalty tax. Together with dividends from NamDeb, a fifty-fifty joint venture between the Namibian government and the South African company De Beers, the diamond-mining industry made up 14.7 percent of government tax and non-tax revenues in 2002/2003. The same period (2002) according to Graph 3 in Appendix 1, the South African Rand depreciated, causing a real increase in diamond taxes in Namibia (Boer & Sherbourne, 2004).⁵ Irrespective of how these revenues later are allocated, they are apparently an important income source for the Namibian government. Yet, it is crucial to note that the diamond revenues are not separated from other government revenues, why the allocation effectively of the revenues are decided by how credible governmental expenditures are in general (IMF, 2008).

The origin of these significant tax revenues and central to this paper, are the diamond exports on which Namibia is unambiguously dependent. Since long, the diamonds have been the largest generator of influx of foreign exchange (CIA The World Factbook, 090423), necessary for moderating pressure on the exchange rate.

As seen in Graph 5 & 6 in Appendix 1, both diamond production and exports have been quite stable, at least as shares of GDP, with smaller downturns in production in 1993 and 2003 and in exports in 2003. This could, to a point, be

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⁴ Gem quality diamonds has a high standard of quality and are, for example, used in jewellery. Other diamonds are of near-gem quality or industrial diamonds (costellos.com.au/diamonds, 090421).

⁵ The numbers should be compared to a profit tax of 35 percent for ordinary companies and royalties of up to five percent (IMF, 2008).
explained by stable export prices for Namibian rough diamonds (i.e. minimally processed), at least since 1995. By extension, volatility in diamond revenues have been relatively stable too (IMF, 2008), which, if export prices remains likewise, merits a continuing contribution to real GDP from diamond exports of about 12-13 percent with a slight decrease to 11 percent after 2020 (IMF, 2008).

In conclusion, the Namibian diamond exports could be readily seen as a major contributor to GDP, with a subliminally air of also doing much for the country's economic growth, further discussed elsewhere in this paper. At the very least, the production and exports of diamonds comprises a large share of value added, as stated in both Graphs 5 & 6 in Appendix 1.

When it comes to employment in the diamond industry, the largest producers and exporters of diamonds by value differs greatly among one another. In Angola, where the industry corresponds to a relatively small part of annual revenues, the total diamond labour force nonetheless counted to approximately 290 000 in 2002. By contrast, in less dense countries with high contribution to government revenues and GDP like Namibia and Botswana, the labour force counted to 2890 respectively 6800 (Boer & Sherbourne, 2004 & Chamber of Mines and Energy, 2007). This contraception bears the notion of two countries highly dependent on the value of diamond exports rather than their ability to create jobs.

This incapacity of job creation could most certainly be derived from the lack of vertical integration with a sustainable domestic, local cutting and polishing industry (Sherbourne, 2009). Even more troublesome, looking at this matter is the tendency of an employment decrease in the industry, both since the Independence and as seen in the predictable future. A sizeable part of this decrease comes from the industry moving offshore (Boer & Sherbourne, 2004), meaning a marine mining on the ocean floor. However, as presumed diamond findings below ground gets exhausted, the Namibian move from on- to offshore mining probably should be seen as a blessing rather than as a source of unemployment.
4.2 Control Variables

Apart from analysing solely the statistical relationship between diamond exports as shares of GDP and economic growth, several other variables are controlled for. The exchange rate, counted on a yearly basis, ought to be relevant since it affects a country's trade pattern. In short, if the exchange rate is overvalued, exports are discouraged and imports encouraged and *vice versa*. In other words, the exchange rate affects economic growth and is thus important to take into account. Furthermore, the overvaluation of an exchange rate could be derived from inflation, causing the local currency to lose its value. This, together with the fact that inflation imposes higher risks and undermines investments, makes it relevant to control against economic growth. Also, both the real exchange rate and inflation are influential determinants of the Dutch disease.

Here it is crucial to mention the close ties to the South African Reserve Bank (SARB) and its monetary policy as the Namibian Dollar is pegged one-to-one to the South African Rand. Although an introduction of a sovereign currency in September 1993, the Namibian Dollar kept parity with the Rand (Boer & Sherbourne, 2004) which has rendered Namibian inflation trends to follow closely those of South Africa (The World Bank, 2009) & NPC/CBS, 2007). This also accrues to interest rates set by the Bank of Namibia. Needless to say, the policies conducted by SARB are vital for Namibia considering the country being a small open economy, dependent on its exports. Luckily, the anti-inflationary policies of South Africa seem to have kept inflation and the exchange rate in relatively modest check (Sherbourne, 2009), albeit emphasizing *relatively* given the currency's volatility compared to stronger ones (see Graph 3 & 4 in Appendix 1).

Two other variables that have a uniform affect on economic growth are investments and savings, shown in Graph 2 in Appendix 1. As mentioned earlier, the Harrod-Domar- and the Solow model assume the variables to be main engines to growth, and should consequently be part of this analysis as control variables. The values are based on numbers from NPC/CBS. Savings are calculated as the difference between disposable income and final consumption expenditure in the national accounts, as recommended by the United Nations System of National
Accounts (1993). Investments, on the other hand, are interpreted as gross fixed capital formation, in accordance with NPC/CBS (2008). Both savings and investments are counted as shares of GDP. Worth noting is that Namibia has a relatively rigid social safety net in general, where the pension system for its huge public sector ought to be mentioned in particular. This has generated big aggregated savings compared to many other developing countries (Sherbourne, 2009).

To be able to take political economy into account in the VEC model, the Human Development Index (HDI), provided by United Nations Development Programme, is used as a measure of institutional quality. The index is an aggregate of vastly different elements, namely: life expectancy, education and GDP and takes on a value between 0 and 1 (Perkins, Radelet & Lindauer, 2006).

Other more obvious measures of institutional quality, such as Transparency International's corruption index or PRSGroup's political risk index would probably have been more suitable for this analysis, but high costs and lack of information prevented the use of them and other measures. Still, it should be mentioned that Namibia was ranked fifth out of 45 African countries in 2006 by Transparency International and came out as number 45 in World Economic Forum's property rights ranking in 2005 (IMF, 2008).

One major constraint to the HDI is that HIV/AIDS has lowered the life expectancy in Namibia, not necessarily caused by bad policy. However, we do believe that the HDI at the very least gives an approximate picture of a country's institutional quality since it is foremost governments that provide health care, education and growth enhancing policies.
5. RESULTS ANALYSIS

In the following we present the results of our VEC analysis. Table 3 solely shows the relationship between diamond exports as share of GDP and the economic growth of Namibia, while Table 4 also includes our control variables discussed in Part 5.2. Furthermore, we use zero lags since the number of observations is limited due to restrictions and the numbers of variables are too many. Initially, we had 15 observations between the years of 1993 and 2007, but after adjustments we have data for 1994 to 2007. Also, it exists one co-integration within our time-series which also is used in the VEC estimation.

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<td>GDP growth(-1)</td>
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Without controlling for actual economic influences, the results from the VEC analysis shows a negative association between Namibian economic growth and diamond exports, supporting an underlying natural resource curse; one unit’s increase in the ratio between diamond exports and GDP would result in a growth decrease of approximately 0.85 units. How should this result be interpreted? Indeed, the numbers indicate that diamond exports in itself affect economic growth negatively. Alas, there is nothing that can work as obvious *eo ipso* other than hard to analyse underlying factors. There is hence important to look upon these results humbly, especially considering the significance level. However, as discussed under 2.1 and 2.2, there are theoretical reasons to assume that Namibia would suffer from an underlying resource curse.

A discussion around this noticeable relationship may instead be derived from what is not taken into account rather than what is actually estimated in *Table 3*. In other words: how does the result change when controlling for inflation, the real exchange rate, savings, investments and the HDI in the VEC analysis?

As seen in *Table 4*, Namibia’s relatively high growth rates since the Independence apparently helps to invalidate a resource curse in general terms: the country has not suffered from lower subsequent growth because of its resource abundance as did several other primary exporting countries, illuminated by Sachs & Warner. This thinking is in line with IMF's view on Namibia and the resource curse (*IMF, 2008*) and is shown when controlling for the variables discussed in Part 5.2. In particular, the VEC analysis predicts that a unit’s increase in the ratio between diamond exports and GDP would render an increase of around 1.68 units in Namibian economic growth, *ceteris paribus*.

In light of previous examples of resource abundant countries with low growth rates it is interesting to analyse how Namibia, albeit dependent on its diamond sector, achieved these growth levels and hence “draw lessons for other countries” (*IMF, 2008*). Consequently, Namibia’s avoidance of low growth rates is in brief discussed within the chosen frameworks of the Dutch disease and institutional quality in the following.
Looking at Graph 4 in Appendix 1, the inflation rate tends to have been quite stable, although high with Western standards. Even so, apparent from the same graph, there was a considerable rise in the inflation rate in 2002, subsequently followed by an appreciation of the N$ looking at Graph 3 in Appendix 1. Following the mentioned pattern, it is tempting to derive these observations to the Dutch disease. However, the theory states that the appreciation stems from large capital inflows, in this case presumably foreign exchange from diamond exports. Neither Table 1 in Appendix 2, nor Graph 6 in Appendix 1 supports a boom in diamond exports around 2002, rendering large influx of foreign exchange compared to earlier years. Also, it is clear from Table 1 in Appendix 2 that “a shrinking of non-resource export sectors” (Ogunleye, 2008) did not occur; the manufacturing sector retained its positive exporting trend. Rather, the appreciated N$ was probably evolved from the depreciation of the South African Rand in 2002, making the currencies rise in subsequent years.

It should be noted that a first VEC estimation gave unrealistically high values on the statistical significance between the real exchange rate and the ratio between diamond exports and economic growth, rendering odd and rather unbelievable results showing that a unit’s increase in diamond exports would give a growth increase way above what could be said to be *comme il faut*. After testing for similar measures, we decided to use the nominal exchange rate (1 US$ = N$) in our econometric framework. This is problematic since it is the appreciation of the real exchange rate that is assumed to create the Dutch disease. However, the nominal exchange rate is one of the underlying determinants of the real exchange rate which, together with the fact that there has not been a general trade boom in Namibia, gives some credibility of the usage of the nominal exchange rate.

Seen from a labour force perspective, there is not much that supports a Dutch disease for Namibia either. Instead, the rising diamond production has been followed by declining employment in the diamond industry according to Graph 7 in Appendix 1. As opposed to most other natural resource abundant countries, the Namibian diamond industry employs just around one percent of the national employment (NPC, 2007 & Chamber of Mines and Energy, 2006). A job decrease in
the manufacturing sector as a consequence of the diamond industry is thus inconceivable. In conclusion, it does not appear as if there has been a shrinkage of the manufacturing sector (i.e. a “disease”) because of the Namibian diamonds.

The Human Development Index was deployed as a measure of institutional quality. A relatively insignificant statistical relationship between the HDI and the diamond abundance's affect on the growth rates was found. Nonetheless, in the context of the validity of the index as a measure of institutional quality, it is important not to draw too hasty conclusions by the results from the VEC analysis and, therefore, discuss institutional quality and a Namibian resource curse in a more qualitative manner with the tools provided by Ross (1997).

Namibia’s high rankings in several international indices and reviews indeed argue for a strong institutional quality. For instance, the stated placements in Transparency International’s corruption index and World Economic Forum's property rights index are noticeable. Moreover, as was noted by the IMF in their review from 2006, the Namibian “Minerals Act and Diamond Act are in line with international best practice” (IMF, 2008). These reasonings are speaking for a dismissal of the cognitive and societal theories. The cognitive theory, for example, assumes a myopic mentality among policymakers, indicating that resource windfalls would create shortsightedness. In practice however, NamDeb is a joint venture between the Namibian government and DeBeers. Consequently, a “myopic disorder among policymakers” could be interpreted as a disorder affecting not only government employees, but also the South African company DeBeers’. It is hard to interpret what that would mean for the Namibian economy but, probably without being too bold, the effects would not be as extensive as myopia in a wholly state-owned company. Furthermore, there has not been any confirmation of a successful societal theory looking at the Namibian growth record. It goes without saying that solely the seemingly rigid Diamond Act probably discourages both of the mentioned theories.

The state-centred theory assumes that the government receives immense revenues from the country's natural resources, freeing them from accountability towards the society they govern. As in the cases above, it is highly doubtful whether
it could be said that Namibia has suffered from an aggregated myopia such as the
state-centred theory assumes. A profound reason behind this is that the diamond
revenues are not separated from other government revenues. As such, the diamond
revenues are part of the government’s general budget and thus creates a situation
where spending decisions does not depend on the source of the revenues. Very
likely, one can assume, the Namibian government would want to levy higher and
broader taxes to finance a huge unemployment, HIV prevalence and young
population, rather than avoid accountability. However, the mentioned issues
together with low average salaries invalidate this stand.

Perhaps the most important lesson to be drawn from the VEC analysis in Table
4 is the high statistical significance of investments on the relationship between
diamond dependency and economic growth, also discovered in Sachs & Warner’s
œuvre (see Part 2). Seemingly, the investment has been channelled so to make use of
resource windfalls for growth enhancing measures. Without mentioning anything
about whether these investments has led to subsequent economic development, it is
obvious that it has been the most important factor, besides Namibia’s institutional
quality, in avoiding the intrinsic resource curse shown in Table 3. As was noted in
Part 3.1, productive investments could hinder the Dutch disease and, according to
the Harrod-Domar- and the Solow model, create economic growth. Looking at Table
4, Namibia’s investments indeed seem to have been productive in that sense.

It is also the case that the Namibian diamond sector comprises a smaller part
to GDP relative many other primary product exporting countries. This also holds
true when looking at employment rates in the industry. Moreover, Sachs & Warner’s
(1995) analysis found Malaysia and Mauritius, two primary product exporting
developing countries, to have relatively sound growth rates during the estimated
time thanks to an almost extreme openness to trade. Albeit not to the same extent,
Namibia is considered to be a small open economy too, indeed something that spurs
economic growth.
Table 4 Vector Error Correction Estimate, with control variables
T-statistics in [ ]

<table>
<thead>
<tr>
<th>Cointegrating Eq:</th>
<th>CointEq1</th>
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</thead>
<tbody>
<tr>
<td>GDP growth (-1)</td>
<td>1.000000</td>
</tr>
<tr>
<td>Diamond export in relation to GDP(-1)</td>
<td>-1.682983</td>
</tr>
<tr>
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<td>[-7.59050]</td>
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<tr>
<td>C</td>
<td>0.174989</td>
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<table>
<thead>
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<th>Error Correction:</th>
<th>D(GDP growth)</th>
<th>D(Diamond export in relation to GDP)</th>
</tr>
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<td>CointEq1</td>
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<td>[0.68526]</td>
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<tr>
<td>C</td>
<td>-0.097634</td>
<td>0.160050</td>
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<td></td>
<td>[-0.24899]</td>
<td>[0.60140]</td>
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<tr>
<td>Exchangerate</td>
<td>0.006276</td>
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<td></td>
<td>[1.07489]</td>
<td>[-1.33461]</td>
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<td>HDI</td>
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<tr>
<td></td>
<td>[0.53713]</td>
<td>[-0.22526]</td>
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<tr>
<td>Inflation</td>
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<td></td>
<td>[0.18622]</td>
<td>[2.16925]</td>
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<td>Investments</td>
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<td>-0.635130</td>
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<td></td>
<td>[-2.16008]</td>
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<td>Savings</td>
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</tr>
<tr>
<td></td>
<td>[1.02122]</td>
<td>[3.15649]</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.536183</td>
<td>0.828988</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.138626</td>
<td>0.682406</td>
</tr>
<tr>
<td>Schwarz criterion</td>
<td>-9.727364</td>
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6. CONCLUDING THOUGHTS

Did Namibia suffer from a resource curse? In general terms, the answer is no. This study instead shows that one unit’s increase in the ratio between diamond exports and GDP would render an increase of around 1.68 units in Namibian economic growth, as shown in Table 4. However, two other conclusions drawn in this paper are more important.

First, Namibia could be assumed to suffer from an intrinsic resource curse, as stated by economic theory and supported by the estimate in Table 3. Secondly, this intuitively leads to the core question of how the country was able to uphold its relatively high growth rates, illuminating this paper’s main conclusion. Without productive investments and sound institutional quality Namibia would possibly suffer from lower growth rates than most resource-poor countries as a result of their diamond dependency. The interpretation is thus straightforward: a negative impact of resource abundance can be avoided.

Nevertheless, the natural resource curse has stricken several countries worldwide, not least in Africa. Indeed, the curse could be seen as one of the fundamental impediments to African development, shredding countries like DR Congo and Rwanda into pieces. With the importance of the Namibian diamonds as a major revenue source in mind, there is still a risk of a resource curse. As this paper has shown, that would probably be a result of less-effective investments or worsen institutional quality.
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APPENDIX 1

Graphs

Graph 1 GDP Growth with 1995 base year
Source: NPC/CBS

Graph 2 Investments and Savings as percentage of GDP
Source: NPC/CBS
**Graph 3** Exchange rate (1 US$ = N$)
*Source: X-rates, closest date to 01-01-year*

**Graph 4** Inflation rate with 1995 as base year
*Source: NPC/CBS*
Graph 5 Diamond production and as percentage of GDP with 1995 as base year
Source: NPC/CBS

Graph 6 Diamond exports and as percentage of GDP with 1995 as base year
Source: NPC/CBS

Graph 7 Employment in the Namibian diamond industry
Source: Chamber of Mines and Energy
APPENDIX 2

Tables

Table 1 Exports of Goods and Services
2007 price in N$ million

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ores and minerals</td>
<td>5185</td>
<td>5567</td>
<td>7013</td>
<td>4739</td>
<td>6289</td>
<td>6666</td>
<td>9661</td>
<td>11384</td>
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<td>Manufactured products</td>
<td>3496</td>
<td>4230</td>
<td>5378</td>
<td>7434</td>
<td>6730</td>
<td>8259</td>
<td>10027</td>
<td>12266</td>
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<tr>
<td><strong>Total exports of goods</strong></td>
<td><strong>9217</strong></td>
<td><strong>10414</strong></td>
<td><strong>13453</strong></td>
<td><strong>13054</strong></td>
<td><strong>13917</strong></td>
<td><strong>16048</strong></td>
<td><strong>20961</strong></td>
<td><strong>25185</strong></td>
</tr>
<tr>
<td><strong>Total exports of services</strong></td>
<td><strong>1871</strong></td>
<td><strong>2160</strong></td>
<td><strong>2845</strong></td>
<td><strong>3131</strong></td>
<td><strong>3075</strong></td>
<td><strong>2631</strong></td>
<td><strong>3598</strong></td>
<td><strong>4233</strong></td>
</tr>
<tr>
<td><strong>Total exports of goods and services</strong></td>
<td><strong>11088</strong></td>
<td><strong>12574</strong></td>
<td><strong>16299</strong></td>
<td><strong>16185</strong></td>
<td><strong>16991</strong></td>
<td><strong>18678</strong></td>
<td><strong>24559</strong></td>
<td><strong>29419</strong></td>
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<tr>
<td>Percent of GDP at market prices</td>
<td>41%</td>
<td>41%</td>
<td>46%</td>
<td>43%</td>
<td>40%</td>
<td>40%</td>
<td>45%</td>
<td>48%</td>
</tr>
</tbody>
</table>

*Source: NPC/CBS, selected product groups*

Table 2 Imports of Goods and Services
2007 price in N$ million

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical products, rubber and plastics</td>
<td>1187</td>
<td>1397</td>
<td>1676</td>
<td>2166</td>
<td>2285</td>
<td>2296</td>
<td>2641</td>
<td>2854</td>
</tr>
<tr>
<td>Machinery and equipment</td>
<td>885</td>
<td>1368</td>
<td>1712</td>
<td>1694</td>
<td>1598</td>
<td>1540</td>
<td>2133</td>
<td>2645</td>
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<tr>
<td>Transport equipment</td>
<td>1668</td>
<td>1795</td>
<td>1992</td>
<td>2303</td>
<td>2477</td>
<td>3140</td>
<td>3476</td>
<td>4956</td>
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<tr>
<td><strong>Imports of goods at 2007 prices</strong></td>
<td><strong>9816</strong></td>
<td><strong>12306</strong></td>
<td><strong>14673</strong></td>
<td><strong>17712</strong></td>
<td><strong>15475</strong></td>
<td><strong>16291</strong></td>
<td><strong>19530</strong></td>
<td><strong>27001</strong></td>
</tr>
<tr>
<td>Services (excl. direct purchases abroad)</td>
<td>1711</td>
<td>1604</td>
<td>1403</td>
<td>1250</td>
<td>1859</td>
<td>1580</td>
<td>2059</td>
<td>2582</td>
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<tr>
<td><strong>Total imports of services</strong></td>
<td><strong>2268</strong></td>
<td><strong>2250</strong></td>
<td><strong>2359</strong></td>
<td><strong>1862</strong></td>
<td><strong>2484</strong></td>
<td><strong>2325</strong></td>
<td><strong>2924</strong></td>
<td><strong>3572</strong></td>
</tr>
<tr>
<td><strong>Total imports of goods and services</strong></td>
<td><strong>12084</strong></td>
<td><strong>14556</strong></td>
<td><strong>17032</strong></td>
<td><strong>19574</strong></td>
<td><strong>17959</strong></td>
<td><strong>18615</strong></td>
<td><strong>22454</strong></td>
<td><strong>30573</strong></td>
</tr>
<tr>
<td>Percent of GDP at market prices</td>
<td>45%</td>
<td>48%</td>
<td>48%</td>
<td>52%</td>
<td>42%</td>
<td>40%</td>
<td>42%</td>
<td>50%</td>
</tr>
</tbody>
</table>

*Source: NPC/CBS, selected product groups*
Econometric Methodology

Vector Autoregressive (VAR) Model

VARs have been demonstrated to have several advantages for estimating systems of economic time-series since they are easy to estimate, are flexible and give a good fit to macroeconomic data. The opportunity of combining the short-run and long-run data by making use of the co-integration assets of the model is an explanation of why the VAR modeling receives the interests of economists and econometricians (Ogunleye, 2008).

While constructing a VAR model, the value of a variable is expressed in a function of the lagged values of that variable and all other variables included in the model. The structured form implies that something can be assumed about the underlying relations among the included variables of a VAR model. This can be expressed as follows (Ogunleye, 2008):

\[
y_t = b_{10} - b_{12}z_t + \gamma_{11}y_{t-1} + \gamma_{12}z_{t-1} + \varepsilon_{yt} \tag{1}
\]

\[
z_t = b_{20} - b_{21}y_t + \gamma_{21}y_{t-1} + \gamma_{22}z_{t-1} + \varepsilon_{zt} \tag{2}
\]

In equation (1) \( y_t \) and \( z_t \) are assumed to be stationary and \( \varepsilon_t \), which is the error terms, are white noise\(^6\). The variables \( y_t \) and \( z_t \) are dependent on one another since their respective variables exists in both of the equations right-hand sides, which implies that the equations cannot be estimated by Ordinary Least Squares (OLS) because the error terms are correlated with an exogenous variable. To prevent this, the equation can be rewritten to (Ogunleye, 2008):

\[
\begin{bmatrix}
1 & b_{12} \\
 b_{21} & 1
\end{bmatrix}
\begin{bmatrix}
y_t \\
z_t
\end{bmatrix}
= 
\begin{bmatrix}
b_{10} \\
b_{20}
\end{bmatrix}
+ 
\begin{bmatrix}
\gamma_{11} & \gamma_{12} \\
\gamma_{21} & \gamma_{22}
\end{bmatrix}
\begin{bmatrix}
y_{t-1} \\
z_{t-1}
\end{bmatrix}
+ 
\begin{bmatrix}
\varepsilon_{yt} \\
\varepsilon_{zt}
\end{bmatrix} \tag{2}
\]

Or:

\(^6\) The error terms mean is zero, their variances are constant and both of the variables are uncorrelated.
Multiplying the VAR model by $B^{-1}$ yields a more reduced form (Ogunleye, 2008):

$$x_t = A_0 + A_1 x_{t-1} + e_t$$  \hspace{1cm} \text{Equation (3)}

Where:

$$A_0 = B^{-1} \Gamma_0, \quad A_1 = B^{-1} \Gamma_1, \quad e_t = B^{-1} e_t$$

**Unit Root Test – Augmented Dickey Fuller test (ADF)**

As previously mentioned, the awareness of if the variables are stationary or not is important since non-stationary variables might result in a spurious regression. The Unit Root Test (ADF) detects if the variable is non-stationary and its unit root. The standard test by Dickey and Fuller (1979) is based on the following model:

$$y_t = \beta_0 + \beta_1 y_{t-1} + y_t + \varepsilon_t$$  \hspace{1cm} \text{Equation (4)}

Or rewritten as:

$$\Delta y_t = \beta_0 + (\beta_1 - 1) y_{t-1} + y_t + \varepsilon_t$$  \hspace{1cm} \text{Equation (5)}

Where: $\Delta y_t = y_t - y_{t-1}$.
The time-series is non-stationary if the coefficient of $y_{t-1}$ is zero and vice versa.

One feature of the Dickey-Fuller test is that the error term is not auto correlated; if it still would be auto correlated more lagged values should be added on the right-hand side of equation (4). Hence, rewriting equation (5) yields the Augmented Dickey-Fuller (ADF) test (Eviews 6 User Guide II):

$$\Delta y_t = \beta_0 + (\beta_1 + \beta_2 - 1) y_{t-1} - \beta_2 \Delta y_t + y_t + \varepsilon_t$$  \hspace{1cm} Equation (6)

This tests if a time-series is affected by temporary or permanent shocks through testing if $(\beta_1 + \beta_2 - 1) = 0$ which implies that the series show evidence of a unit root, being non-stationary. Furthermore, if $(\beta_1 + \beta_2 - 1) \neq 0$ the time series does not have a unit root and is thus stationary (Perman & Byrne, 2006).

**Integration and Co-integration**

For an acceptable approach when analyzing correlations between economic time-series, we need to have knowledge about the order of integration $I(d)$ of those time-series. If a regression is conducted on series with different levels of integration it subsist a bias in the estimation which might lead to false correlations. If the variables are not stationary they can be combined together to a linear correlation, which mutually results in a stationary variable. Collectively, these variables constitute a co-integrated $I(d,b)$ relationship which implies that there is a long-run equilibrium between them (Juselius, 2006).

The basic definition of the series $x$ is integrated of order $d$ if $x_t$ has the representation $(1-L)^d x_t = C(L)\varepsilon_t$ where $C(1) \neq 0$ and that the error term is $\varepsilon_t \sim Niid(0,\sigma^2)$ which implies that $\varepsilon_t$ is uncorrelated and normally distributed (Juselius, 2006). A common test to estimate time-series order of integration is the ADF-test, which is used in this analysis (Ogunleye, 2008).

The co-integrated relationship is derived from the $I(d)$ process $x_t$ and is said to be co-integrated $I(d,b)$ with co-integrated vector $\beta \neq 0$ if $\beta X_t$ is $I(d-b), b = 1,\ldots,d, d=1,\ldots$
Consequently, co-integration implies that it exists a specific constraint while operating on long-run variables which can be interpreted as long-run equilibrium relationships between the variables. There are several tests for this purpose, but the most general of them is the multivariate test that is based on the VAR model’s representation of Johansen’s maximum likelihood estimation approach which implies that co-integration designates causal effects (Ogunleye, 2008).

**Error Correction Mechanism Model**

To be able to understand the implication of a VEC, a basic knowledge about the *Error Correction Mechanism* (ECM) is needed. The ECM model has given the time-series analysis a reliable extent to the VAR model since different unique time-series that are non-stationary, but have some linear correlation, can be stationary without divergence, namely co-integration (Granger, 1986). The ECM uses the qualities of time-series by allocating long-term components of variables to relate to equilibrium constraints, while short-term components have dynamic specifications (Engle & Granger, 1987). Therefore, ECMs allows both long- and short-run qualities in the same model and thus provides knowledge about the underlying dynamics of the empirical economic results.

Assume the two time-series \( x_t \) and \( y_t \) where \( x_t \sim I(1) \) and \( y_t \sim I(1) \) are co-integrated with \( \mu \sim I(0) \) which describes the distance between the first two variables; if \( I(1) \) the variable is integrated by order 1 and is consequently non-stationary. Both time-series has the long-run equilibrium \( y_t = \beta x_t \) and since they are co-integrated they are assumed to return to the long-run equilibrium after a shock. The relationship between co-integration and ECM can be expressed as follows (Enders, 1995):

\[
\begin{align*}
\Delta x_t &= \alpha_x (y_{t-1} - \beta x_{t-1}) + \varepsilon_{xt} \\
\Delta y_t &= -\alpha_y (y_{t-1} - \beta x_{t-1}) + \varepsilon_{yt}
\end{align*}
\]

*Equation (7)*
The parameters $\alpha_x$, $\alpha_y$ and $\beta$ in the above equation are positive and the error-terms, $\varepsilon_u$ and $\varepsilon_{yt}$, are assumed to be white noise. Changes in $x_t$ and $y_t$ are implied to respond to stochastic shocks, the error-terms, and the previously periods distance to the long-run equilibrium, $y_t = \beta x_t$. Since both time-series have the same long-run equilibrium, $\alpha_x$ and $\alpha_y$ show how strong they react to a distance that is larger than $\mu \sim I(0)$. Then $x_t \sim I(1)$ implies that $\Delta x_t$ is stationary, $\Delta x_t \sim I(0)$, and if the left-hand side of the equation is $I(0)$, the right-hand side of the logically consistent equation is also $I(0)$. If we also assume that the error-term, $\varepsilon_u$, is stationary it reveals that the linear combination $(y_{t-1} - \beta x_{t-1})$ also has to be stationary. Thus, a stationary linear combination of $x_t$ and $y_t$ implies that they are co-integrated where the co-integrating vector is $\begin{bmatrix} 1 \\ -\beta \end{bmatrix}$. The above explanation shows that it is a prerequisite to the ECM that both $x_t$ and $y_t$ are co-integrated by the order CI(1,1), which means that the time-series are integrated by $I(1)$ and that the linear combination of the time-series have a lower order of integration than the time-series (Enders, 1995).

To comprehend the implications of co-integration and the ECM modelling for VAR models, consider equation (2) from above and add the ECM specifications. A VEC model describes vector terms in divergences and is explained by lagged vector terms in divergences as well as in order. The VAR equation (2) takes the form of a VEC (Charemza & Deadman, 1997):

$$\begin{bmatrix} \Delta y_t \\ \Delta x_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix} + \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} \Delta y_{t-1} \\ \Delta x_{t-1} \end{bmatrix} + \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} y_{t-1} - bx_{t-1} + \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_u \end{bmatrix}$$

Equation (8)

Where $\begin{bmatrix} a_1 \\ a_2 \end{bmatrix} y_{t-1} - bx_{t-1}$ is the Error Correction term.