

Enabling Foreign Exchange Management through GIS

Abstract

New derivative products and new statistical techniques including big data analysis have brought about a lot of advancements in foreign exchange management. Companies are also disclosing more information on foreign exchange exposures including economic exposure and causes and impact of changes in these exposures on their profitability and asset base. The next step, as advocated in this study, may be to combine spatial visualization techniques developed with the help of GIS to map out the different types of foreign exchange exposures territory-wise and, thereby, enhance understanding of the strategies required to manage these exposures. This study looks at the previous literature on applications of GIS towards increasing efficiencies in business processes including market share enhancement and optimization of branch location and conceptualizes their use in the field of foreign exchange management similar to their use in the financial derivatives market advocated by earlier researchers.

Keywords: Geographic Information System (GIS), Spatial Distribution of Currency Risks, Choice of Functional Currency

Introduction

Foreign exchange management is one of the crucial activities being performed by companies as international operations gather pace and encompass a whole array of trade and money market transactions including borrowings and lending as well as the ever-growing supply chain and value-addition networks. A mapping of areas of concentration in terms of invoice currency for exports, sources of imports, borrowings & lending and other international transactions such as cross-border lease or royalty payments could provide quite informative inputs for foreign exchange management as most companies adopt a portfolio approach to managing their foreign currency risks (Chandrinou and Lagaros, 2018). Netting, for example, has been one of the key techniques of foreign exchange management requiring data on expected value of specified foreign currency inflows and outflows. Decisions on hedging will usually follow completion of this exercise. A dynamic map, for example, that allows the reader to visualize the impact of a change in supplier or customer or even an employee location on the specific currency that would need to be hedged along with other parameters such as the period and quantum of hedging would be highly informative (ESRI, 2007). Similar impact could be worked out of shifts in periods of supply or periods of field employee contracts. GIS (Geographic Information Software) enables this dynamism to study the inter-relationships between different variables. GIS, often touted as management through geography, has vast implications for not only natural resource management that includes valuation of assets but also ordinary business decisions involving expansions territorially or product expansions and changes in international supplier networks (ESRI, 2007). Each of these decisions may change the currency, the quantum of currency that may need to be managed, as well as the way in which that may be managed. In fact, companies can work out

several combinations and permutations of the different variables which lead to decisions regarding foreign exchange management. A 3D GIS can create realistic simulations to aid in foreign exchange management.

Previous Studies on Use of GIS in Business

So far, GIS has been used by companies mainly for marketing their products. O'Malley, Patterson and Evans (1997) documented its use in site selection; Mitchell & McGoldrick (1994) in market area analysis; Smith, Langley & Mundy (1998), Weigel & Cao (1999), Vlachopoulou, Silleos & Manthou (2001) in sales territory analysis, routing planning, real-time logistics planning and location-based services, Thrall (1998) in real estate and related industries, Can (1998) in housing and mortgage markets and Monzon-Perez, Watson and Simundza (2011) in improving business performance including future scenario modeling. Other authors like Li, Heng, Kong, Pang, Shi & Ling (2003), Rikalovic, Cosic and Lazarevic (2014), Li (2005) and Fernando, Sangasumana, and Edussuriya (2015) have also noted the use of GIS in industrial site selection. Birkin and Clarke (1998) have advocated the use of geodemographic systems coupled with spatial location models and GIS to support decision making about branch openings, closures and company mergers. Böckerman and Lehto (2006) studied the geography of domestic mergers and acquisitions from the regional perspective. Voivontas, Tsiligiridis and Assimacopoulos (1998) combined geographic database with climate data for estimating solar energy and market potential for water heating in the residential sector.

Li, Chen, Yong and Kong (2005) have studied the use of integrated GPS and GIS in reducing construction waste and improving construction efficiency. Cheng, Li and Yu (2007) have indicated the use of GIS to study appropriate location for shopping malls. Hess, Rubin & West Jr (2004) have documented how GIS helps in the improvement in effectiveness of data presentation. Anumba, Dainty Ison and Sergeant (2005) have talked about the need for spatially-oriented labour market information for developing effective labour market policy in the UK construction industry. According to them, often, the socio-economic context of the area under consideration had a high correlation with the level of regional and local skills required for the construction industry. GIS operations in real estate have included address matching, data-geocoding, data query and overlay analysis to encode and map property values. This has helped in resource inventory identification and analysis, change pattern detection, resource routing and land-use/environmental planning. Data query helps in identifying and isolating properties with given attributes and/or conditions. Ballas and Clarke (2000) studied the use of GIS to model the geographical impact of national government policies. Eldrandaly (2010) have addressed the Multisite Land Use Allocation (MLUA) problem through the integration of Gene Expression Programming (GEP) – an Artificial Intelligence technique with GIS as part of Spatial Decision Support System (SDSS) for dealing with resource allocation issues. In their earlier paper on COM-based spatial decision support system of 2003, they presented a decision support system in which Expert Systems, GIS and a Multi-Criteria Decision method were integrated by using the component object model (COM) technology to achieve software interoperability. Fujita, Krugman and Venables (2001) stress on the concept of economic geography that deals with selection of the most appropriate location for economic activity. Leyshon, French and Signoretta (2008) in their study reveal uneven geography of retail financial services production and consumption as most bank and building society closures in Britain between 1995 and 2003 tended to be

89 disproportionately concentrated in poorer areas. Miller, Mangold and Holmes (2006) discuss
90 integration of GIS into business curricula and develop a retail site selection prototype module
91 in a retail management course.

92 In a study on ‘Trajectory-Based Visual Analysis of Large Financial Time-Series Data’,
93 Schreck, Tekušová, Kohlhammer and Fellner (2007) showed that the visual analytics
94 technology is particularly relevant in financial markets that generate real-time data on a
95 continuous basis. In the Visual Analytics model, automatic data analysis is applied to screen,
96 filter, sort, aggregate and abstract the raw data. The authors applied automated data mining
97 methods - specifically cluster and statistical analysis – and found them to be tightly coupled
98 with well-designed visualization techniques. The temporal sequence of patterns, particularly
99 the inter-week patterns for a selected asset are analysed using visual analytics. Popular assets
100 selected are equities, currencies, bonds, etc. and their monitoring and management are aided
101 through this technique.

102 Saiz (2010) studied geographical and regulatory endogenous restrictions on land use to
103 estimate housing price elasticities at the Metropolitan Statistical Level (MSL). In high-
104 elasticity areas, housing inventories increased as the housing bubble expanded, whereas low-
105 elasticity areas were found to be more sensitive to local pricing conditions. Robb and
106 Robinson (2014) used this data to study the effect of the housing boom on access to capital
107 and found that in high-elasticity-areas, homes provided higher collateral values and,
108 therefore, an easy access to capital which helped entrepreneurship in turn. Thus, a
109 relationship between GIS and capital structure was found by the authors. Bateman, Lovett,
110 and Brainard (2003) employed the GIS approach to estimating the costs and benefits of
111 converting woodlands into agricultural lands. Another study by Samanta, Pal and Pal (2011)
112 used multi-criteria decision approach through GIS to study land suitability for rice
113 cultivation. Noon and Hankins (2001) used spatial data visualization in healthcare to aid in
114 decisions concerning facility location and service. The facility in their study was a proposed
115 Neonatal Intensive Care Unit (NICU) as part of a system’s network of rural hospitals.

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117 **Previous Studies on Use of GIS in Risk Analysis in Foreign Exchange Markets**

118 When treasury managers lay down a foreign exchange policy for the organization, they
119 necessarily include a wide variety of perspectives before the final document comes out. The
120 document begins with the objective of the policy which may be either profit maximization or
121 minimization of volatilities in cash flows. The GIS software enables users to see the result of
122 change in objectives on foreign exchange management. In fact, the GIS software can assist
123 in the formulation of the policy itself. Management, for example, has to be able to study the
124 impact of each type of foreign exchange exposure on its operating cash flows and accordingly
125 decide the type of exposure to be hedged. The netting strategy is usually optimal for
126 transaction exposures which are the most visible exposures. When it comes to translation
127 exposures, the choice of the currency in which consolidated statements are prepared can turn
128 out to be quite crucial in the determination and management of the exposure. Economic
129 exposure management necessitates a long-term view with a number of available hedging
130 options that may require structural changes in operations. For example, changes with regard
131 to customer markets or supplier markets or the invoice currency can all drastically alter the
132 competitive space within which a company is operating. Another crucial area of decision-
133 making relates to risk management that may require laying down risk limits beyond which

only hedging would be adopted. Laying down these limits requires estimates of probabilities of each type of risk and its impact on the operating cash flows. GIS can assist in the mapping of probability and impact of each of the exposures. The income statements of companies gives us only the impact of foreign exchange fluctuations on income but an analysis of the dynamic cash flow.

In studies on hedging in foreign currency markets; often, a reference is made to return-risk ratios. Hammer (1988), for example, in his study elaborates on the notion of pure risk-avoidance strategies involving equal-but-opposite hedge strategies as sub-optimal under given situations. This notion was expressed by Working (1962) in his paper on 'Future Markets under Renewed Attack' in which he also mentioned that pure risk avoidance was virtually non-existent in modern business practice. The hedging decision is commonly a function of risk-return objectives and subjective estimates regarding the future spot rate. That is why, Hammer (1988) talked about developing bounded sets of cash flow hedge and anticipatory hedge strategies enabling potential trade-offs between risk and return and thereby partial hedges. Decisions on partial hedges could as well be largely facilitated by GIS with spatial mapping of return per unit of variance of each asset class. The pure risk avoidance strategy simply considers risk avoidance, i.e. minimizing variability of cash flows even though it may result in negative returns. There is a cost of every hedging strategy and this cost can make the return negative, particularly when indirect cost of missing the potential upside is also included in the calculations. Wang, Alam, and Makar (2005) in their study on foreign exchange reporting in annual reports show that although foreign exchange gains and losses on cash flow hedges are shown in Other Comprehensive Income (OCI), investors are unable to make accurate cash flow predictions on account of two reasons: i) hedge ratios are not reported by companies; and ii) offsetting movements in the underlying are not reported along with gains/losses on FX cash flow hedges. According to them, investors tend to assign lower risk premiums to companies reporting FX gains/losses in OCI in the belief that the total FX cash flow exposure has been hedged whereas, in practice, only a small portion of that exposure may have been hedged. Studies by Working (1962) and Hammer (1988) show that while this is true, the objectives of the foreign exchange policy should also be spelt out for better investor information. And GIS can address the missing data on movements in the underlying through variability maps of each asset class. Investors will then be able to compare the variability of the FX cash flow hedge with variability in the underlying asset and, thereby, gauge more appropriately the effectiveness of the hedge. In an article on augmenting data warehouses with big data, Jukić, Sharma, Nestorov and Jukić (2015) show that big data, other than acting as a source for impactful analysis, is itself a source for enhancing the efficiency of data warehouses. This means that data warehouses should be able to stream real-time data rather than just a stock of data. A process called ETL that stands for extraction, transformation and load is employed to first extract analytically useful data from given data sources, transform the extracted data to conform to the architecture of the data warehouse and finally load the data into the data warehouse. Such augmented data warehouses increase the efficiency of other software like the GIS. As big data will be automatically screened for the currency denomination of transactions and its impact on competitiveness region-wise and product-wise, the results from GIS applications from a dynamic data warehouse are bound to be very informative.

Similarly, GIS is highly useful in understanding the foreign currency risk of a company in relation to the total risk of the company. Just as netting is helpful in reducing the transaction exposure of a company, it is possible that the foreign exchange exposure after netting, itself gets netted out when seen in the context of a portfolio of operational risk, credit risk, FX risks and interest rate risks. VaR (Value at Risk) is a fairly well used measure to estimate the value of a company's assets that may be said to be facing probable risk of declines in value. Geberit International AG- Geberit Group, for example, reported in its annual report of 2015 that the Group used statistical methods to arrive at the effect of probable changes in foreign exchange rates on the fair value of foreign currency positions and thereby on the consolidated financial result. The report further mentions that the risk is controlled with the key figure (VaR +/- unrealised gains/losses from foreign exchange positions)/equity. The Group worked out internal limits to decide whether any hedging measures had to be resorted to. For example, it was reported that the Group resorts to forward contracts if the limit for the key figure amounts to 0.5% of equity for the reporting period. Infosys Ltd in its annual report 2016-17 contained the following statement: *'The Company designates certain foreign exchange forward and options contracts as cash flow hedges to mitigate the risk of foreign exchange exposure on highly probable forecast cash transactions'*. This shows that the netted amount is further screened and only where there is a high probability of the occurrence of cash flows, hedging strategies are applied. Now GIS can help in the categorization of cash flows as per their probabilities of occurrence of cash flows and, thereby, easily draw out data that would need to be hedged after considering the risk preferences of the organization. While a low risk preference would suggest that all of the netted amount be hedged, a high risk preference would mean that the organization would remain exposed to changes in exchange rates. In addition to VaR, therefore, another measure, viz the CfaR or the cash flow at risk is often calculated to understand the impact of changes in exchange rates on the operations of a company. The CfaR measure is often preferred to Earnings at Risk (EaR) measure because earnings is an accounting concept whose value is dependent on the choice of accounting policies. With roughly 10,000 simulations in VaR or CfaR over the desired planning period, estimates of the value or cash flow at risk due to exchange rate or interest rate changes are arrived at with assigned degrees of confidence (Hommel & Gerner, 2011).

This ability to simulate different situations also comes in handy during mergers & acquisitions. Through GIS, companies are able to estimate whether the new merged entity would create adequate synergies as also the changes in operations or location of stores that may be necessary to make possible the needed synergies (Bockerman & Lehto, 2006). GIS-based, location-focused data analysis and business modeling helps in identifying the expectations, needs, and costs to support new customers in a new service territory. GIS, thus, helps to work through the unforeseen issues that mergers can create. Mapping, visualization, and spatial analysis are powerful business tools that help ensure a smooth and necessary transition from initial business evaluation to planning and final execution. During the execution phase, GIS-based location-focused data analysis and business modeling identifies the expectations, needs, and costs to support new customers in a new service territory. And these new costs can include foreign exchange costs that may come in due to locational changes.

Similarly, GIS is a useful emergency planner that is used to calculate emergency response time and the movement of response resources (Gunes & Kovel, 2011). In foreign exchange markets, emergency responses may be required in case of sharp changes to exchange rates or sharp structural changes in business operations such as sudden loss of suppliers, customers or

employees. At that time, adequacy of response resources to combat the effect on business operations assumes vital significance. The response resources in foreign exchange markets will normally be the foreign exchange reserves. That is why, for macroeconomic stability too, foreign exchange reserves are considered very significant. Due to increasing uncertainties in financial markets, international businesses must have adequate capital and foreign exchange reserves. Auto companies like Volkswagen have openly reported the following in their Annual Report of 2017:

‘The adoption of enhanced emission standards, particularly in developing countries, is likely to introduce higher volatility in their cash flows. In general, the Company is a net receiver of currencies other than the U.S. dollar. Accordingly, changes in exchange rates, and in particular a strengthening of the U.S. dollar, will negatively affect the Company’s net sales and gross margins as expressed in U.S. dollars. There is a risk that the Company will have to adjust local currency product pricing due to competitive pressures when there have been significant volatility in foreign currency exchange rates’.

Foreign Exchange Management through Choice of Functional Currency

Another way in which companies manage their foreign exchange risks is through changes in functional currency. A functional currency is the currency of the primary economic environment in which the entity operates. Thus, subsidiary companies could have functional currencies that are different from the parent company’s currency (Louis, 2003). A company, for example, registered in Singapore and having major business transactions in Singapore dollars (SGD) is likely to choose SGD as its functional currency, although the parent company may be based in another country. Now, while the choice of the functional currency should be determined by the dominance of that currency in its economic transactions, the fact is that at times when receipts may be in one currency and payments in another currency, it may become quite difficult to determine the functional currency.

Appendix I contains statements made by some companies with respect to changes in functional currency. As seen in the Appendix, auditors can find it difficult to audit the circumstances leading to the change in functional currency. Companies do inform investors about change in functional currency but not many companies explain the accounting impact of the change in the functional currency or even elaborate on the reasons for the change made. A spatial distribution of the currencies of a company’s receipts and payments through GIS is likely to help both in the determination of the functional currency as well as determining/understanding the reasons for the change, if any. This is likely to be of great help to companies having international operations in several countries.

Concluding Observations - Impact on Foreign Exchange Derivatives

Ever since GIS expanded its utility by finding applications in the financial world, its inroads in the foreign exchange market would seem an obvious off-shoot. Yet, the consequences can be quite disruptive to the foreign exchange derivatives market. A clearer picture of the source of foreign exchange risks and their relationship to total risks on a dynamic basis could bring down foreign exchange exposures and consequently the use of derivatives. Derivatives are known to be imperfect hedges due to the often imperfect match with the underlying

transactions. Employing imperfect hedges has its own costs which also serves to reduce the effectiveness of the hedge instrument. GIS, therefore, can carve out a niche for itself in the management of foreign exchange exposures. Lien and Shrestha (2014) have earlier studied the use of GIS in discovering price in futures markets which has implications for forex markets. Additionally, GIS can help in the selection and optimization of the use of foreign exchange derivatives. Although forwards are currently the most favoured, cross-currency swaps could gain currency through the employment of visualization techniques. Cross-currency swaps presently are less popular than interest rate swaps, in part due to the larger volatility of currency rates as opposed to interest rates. Visualization of past movements in currencies together with processing of unstructured data through data analytics could provide useful leads to the permutations and combinations of different cross-currency swaps that may be formed for the purpose of risk minimization.

GIS, thus, has the potential to introduce different perspectives in the foreign exchange market that may prove useful into businesses in their risk management efforts.

Appendix I – Examples of Functional Currency Notes in Annual Reports of Companies

Following are some examples of notes appearing in annual reports on reasons for or impact of changes made in functional currency:

i) Wilton Resources Corporation Annual Report, 2014

Change in functional currency and presentation currency

The financial statements for the Company and WRH for the financial year ended 30 June 2013 were previously measured and presented in Singapore Dollars (“SGD” or “S\$”). The Company and WRH changed its functional currency from SGD to Indonesian Rupiah (“IDR” or “Rp”) on 12 December 2013 and 30 September 2013 respectively as disclosed in Note 2.5. With the change in functional currency from SGD to IDR, WRH and the Company has changed its presentation currency to IDR, which is accounted for retrospectively in accordance with FRS 8 Accounting policies, Changes in Accounting Estimates and Errors. Accordingly, the Company has presented the opening balance sheet as at 1 July 2012.

As a result of the change in functional currency, the Group changed its presentation currency from SGD to IDR.

ii) Ezion Holdings Limited Annual Report 2011

Functional and presentation currency

These financial statements are presented in United States dollars (“US\$”), which is the Company’s functional currency. All financial information presented in United States dollars has been rounded to the nearest thousand, unless otherwise stated.

Change in functional currency and presentation currency

With effect from 1 January 2011, as a result of a change in underlying transactions, events and conditions relevant to the Company, the functional currency of the Company was changed from Singapore dollars (“S\$”) to US\$. In line with the change in functional currency, the presentation currency was changed from Singapore dollars to US\$. The comparative information has been re-presented to conform with current year’s presentation.

iii) AddValue Technologies Ltd Annual Report 2012

Determination of Functional Currency

With regard to the foreign exchange exposure, the Group’s revenues and purchases are denominated principally in US\$ and to a much lesser extent in Euro while its overhead expenses, comprising mainly staff costs and administration expenses, as well as its prevailing loans from banks and financial institutions are denominated in S\$. In respect of the revenues denominated in US\$ or Euro, a price adjustment mechanism is always built into the relevant supply contract to make up for any material undue foreign exchange movements to mitigate the effects.

The Change in Functional and Presentation Currency

The functional currency of the Company and its subsidiaries has been changed from Singapore dollars (“S\$”) to United States dollars (“US\$”) since 1 April 2011 (the “Change in Functional Currency”) as the Company is of the opinion that US\$ best reflects the current and prospective economic substance of the underlying transactions and circumstances of the Group, given that:

1. the sale of products of the Group (as contrasted against design income) has, since FY2010, been dominated and is expected to continue to dominate the revenue stream of the Group; and
2. most of the revenue and purchases of the Group had been and are expected to continue to be transacted in US\$ (although most of the Group’s administrative expenses are expected to continue to be denominated in S\$).

The effect of the Change in Functional Currency was applied prospectively in the financial statements for FY2012. The comparative figures have been translated from its functional currency of S\$ to US\$ using the exchange rate as at 1 April 2011. In conjunction with The Change in Functional Currency, the Group changed its presentation currency from S\$ to US\$. This change was applied retrospectively and the assets and liabilities (including opening balances from the earliest prior period presented) were translated and re-presented in US\$ at the closing rate of the respective year end while income and expenses were translated at the average exchange rate with all resulting exchange differences recognised in other comprehensive income.

- iv) Welltec International ApS, Denmark Annual Report, 2013

Change in presentation and functional currency

In the third quarter, Management decided to change the reporting currency of its consolidated financial statements to USD in order, to best represent the core business performance and its underlying exposures. This is both from an operational and a capital structure perspective. In addition this accommodates requests from investors and serves to make the consolidated financial statements more comparable within Welltec’s peer group. At the same, management reconsidered the group’s functional currency and assessed the USD to be the functional currency for the Danish operation and operations in some other countries. Management identified the issuance of USD bonds in the beginning of 2012 as the main event triggering the change in functional currency from DKK to USD, and consequently the change in functional currency is deemed to have taken place at that date.

- v) Lisi Group (Holdings) Ltd Annual Report, 2012

Change in Functional Currency

Items included in the consolidated financial statements of each of the Group’s entities are measured using the currency of the primary economic environment in which the entity operates (the “functional currency”). In prior years, the Directors regarded Hong Kong dollar (“HKD”) as the functional currency of the Company. Upon the completion of the

acquisition of a wholly-owned subsidiary group in Ningbo, the PRC, whose functional currency is Renminbi (“RMB”) in April 2010 and the restructuring of the Group’s operation in Shenzhen, the PRC in April 2011, the Directors consider that the primary economic environment has been substantially changed. Since then, the Company’s primary source of revenue, that is, dividend, is derived from the operation of its major subsidiaries operating in the PRC, whose functional currency is RMB. Accordingly, the Directors have determined the change of the functional and presentation currencies of the Company from HKD to RMB starting from 1 April 2011. The change in functional currency of the Company was applied prospectively from the date of change in accordance with HKAS 21 “The Effect of Changes in Foreign Exchange Rates”. On the date of the change of functional currency, all assets, liabilities and income statement items were translated into RMB at the exchange rate on that date. As a result, the cumulative currency translation differences which had arisen up to the date of the change of functional currency were reallocated to other components within equity. Whereas the change in presentation currency of the Company was applied retrospectively in accordance with HKAS 8 “Accounting Policies, Changes in Accounting Estimates and Errors”, the comparative figures presented in these consolidated financial statements have also been restated to the change in presentation currency to RMB accordingly.

vi) DCC PLC Annual Report, 2013

Change in Functional Currency

On 26 February 2013 the Group announced that from the financial year beginning 1 April 2013 it will be changing the currency in which it presents its financial results from euro to UK pounds sterling (‘sterling’). To assist shareholders during this change, comparative financial information for the financial years ending 31 March 2010, 2011, 2012 and 2013 is re-presented in sterling below.

Basis of preparation

DCC plc will present its results in sterling with effect from 1 April 2013. For the financial years ending 31 March 2010, 2011, 2012 and 2013, the Company has presented a condensed Group Income Statement, Group Balance Sheet and Group Cash Flow Statement as at 31 March for each of these years. This financial information will form the basis of the comparative financial information expected to be included in the first complete set of financial statements of the Group presented in sterling for the year ended 31 March 2014. In order to satisfy the requirements of IAS 21 with respect to a change in presentation currency, the statutory financial information as previously reported in the Group’s Annual Reports for the years ended 31 March 2010, 2011, 2012 and 2013 has been restated from euro into sterling using the procedures outlined below:

- assets and liabilities of foreign operations where the functional currency is other than sterling were translated into sterling at the relevant closing rates of exchange. Non-sterling trading results were translated into sterling at the relevant average rates of exchange. Differences arising from the retranslation of the opening net assets and the results for the year have been taken to the foreign currency translation reserve;
- the cumulative foreign currency translation reserve was set to nil at 1 April 2004, the date of transition to IFRS. All subsequent movements comprising differences on the retranslation of the opening net assets of non-sterling subsidiaries have been taken to the foreign currency

translation reserve. Share capital, share premium and other reserves were translated at the historic rates prevailing at the dates of transactions; and

- all exchange rates used were extracted from the Group's underlying financial records.

vii) AkerBP Ltd Annual Report, 2015

Change in functional currency to USD and Q4 2014 impairment

Following the acquisition of Marathon Oil Norge AS, Detnorskeoljeselskap ASA's («DETNOR») functional currency is assessed to be U.S. Dollars (USD). The change in functional currency from Norwegian Kroner (NOK) will have effect from October 15, 2014, which was the closing date for the acquisition of Marathon Oil Norge AS. The upcoming Q4 2014 financials to be released on February 25, 2015 will thus be reported in USD. The balance sheet has been converted to USD at a rate of 6.6161 per October 15, 2014.

As part of the purchase price allocation for the acquisition of Marathon Oil Norge AS, Detnorskeoljeselskap recognized regular goodwill of approximately USD 300 million and technical goodwill of approximately USD 1,200 million as per the accounting requirements for financial reporting purposes under IFRS 3. In the fourth quarter 2014 financials, Detnorske will incur a non-cash net impairment charge in the range of USD 320-340 million (pre- and post tax – unaudited), consisting mainly of technical goodwill.

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