SDiX Singapore Diamond Investment Exchange Pte Ltd

DIAMONDS: A RISING ASSET CLASS

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CONTENTS

1. INTRODUCTION

Diamonds are well known for scoring headlines, like the recent record auction in November 2015 of a rare 12.03 carat blue diamond, which fetched US$48.5million. The Blue Moon diamond, promptly renamed as the "Blue Moon of Josephine" by its new owner, reached the new record after beating Graff Pink's US$46.2million set in 2010. While coloured and large diamonds have been well covered in the media, the reality is that little is known about diamonds as an investment. Polished diamonds are often appreciated for their consumption utility, typically as jewelry, and also as a store of value. A 2012 survey by Barclays noted that nearly one-third of owners of precious jewelry owned it for security should other investments fail.

Intuitively, for objects of desire that can cost millions, it stands to reason that polished diamonds have an intrinsic value akin to that of precious metals. Investors are buying into something that is "solid and tangible". This is a key differentiating factor between real assets and financial assets such as equities. Like precious metals, it would also be reasonable to assume that diamonds possess a safe haven quality, meaning that during a crisis, diamonds should appreciate

THE BLUE MOON DIAMOND

The Blue Moon diamond sold for US$48.5million in November 2015 at a Sotheby's Geneva auction, setting the record for the most expensive jewel ever sold at auction. It was also the highest-ever price per carat, at over US$4million.

Source: GIA

The Blue Moon diamond was sold by Sotheby's in November 2015, and was later renamed "Blue Moon of Josephine".

or hold their value. However, questions remain: for example, what categories of diamonds represent the best investments? Does the addition of diamonds diversify one's portfolio, leading to better risk-adjusted returns? Even if diamonds have diversification benefits, what about liquidity – the ability to exit the investment without a significant loss?

This handbook aims to answer some of these questions, surveying also the earlier findings from academic research. The handbook also aims to demonstrate the effectiveness of including diamonds in a portfolio of both real and financial assets. Bearing in mind that the focus here is on diamonds as an investment vehicle, this handbook takes into consideration, among other things, liquidity, cost of carry and the ease of constructing a trade or portfolio using the products listed on the Singapore Diamond Investment Exchange (SDiX). The handbook also touches on the differences between investing on an exchange versus investing over-the-counter (OTC) in light of recent investigations into certain financial institutions. For investors who are keen to invest in single gems, this handbook also has a dedicated section to describing their characteristics.

2. DIAMONDS AS AN ASSET CLASS

First, what is an asset class? An asset class is typically defined as a group of securities or assets that behave similarly in the marketplace, and often times governed by the same set of laws and regulations. Broadly speaking, there are 3 traditional asset classes – equities, bonds and cash equivalents. However, once we branch away from these 3 and into alternative investments, definitions can get unclear.

For example, if an investor branches into real estate, commodities, private equity, hedge funds, etc., the definition of being governed by the same set of laws and regulations may not apply. Even when we speak of globalised products such as commodities or foreign exchange and sometimes even homogenised products, rules may differ when moving from timezone to timezone, geography to geography. While there are efforts to harmonise standards across the world to prevent regulatory arbitrage, the real world is very different and functions with a host of imperfections and inefficiencies.

For these reasons, it is perhaps much more useful to define an asset class as a group that behaves differently from other groups and performs differently in terms of risk and return characteristics in any given market environment. Put another way, the litmus test for an asset class, is when it is added to a portfolio of already well-diversified assets, it yields further diversification benefits, and consequently improves risk-adjusted returns.

Modern portfolio theory explains that there is an efficient frontier of portfolios each having a different risk profile hence yielding different returns. However, each of these portfolios is also Pareto optimal; in other words, it is no longer possible to further diversify these portfolios to achieve higher returns for each given unit of risk.

Recalling the litmus test, we set about adding diamonds to a portfolio of global assets to see if diamonds can indeed further improve the efficient frontier of portfolios.

2.1 DIVERSIFICATION BENEFITS OF DIAMONDS

In earlier academic research, Renneboog and Spaenjers (2012) found in the period from 2003 to 2010, real annualised returns of 10% for white diamonds, 5.5% for coloured diamonds and 6.8% for other gems. The authors also found the returns of both white and coloured diamonds to have outperformed the stock market over that time frame. Diamond returns were also found to have covaried positively with stock market returns and the authors concluded that this confirmed previous evidence on the importance of wealth effects on the demand for luxury goods consumption.

On the other hand, other researchers Auer and Schuhmacher (2013) found contrasting evidence to that of Renneboog and Spaenjers. In Auer and Schuhmacher's research, they found that 10 diamond indices exhibited low correlations with each of the three components of the world portfolio (stocks, bonds, commodities). They concluded that diamonds are at best a hedge and a weak safe haven asset, and having close to zero correlations with traditional asset classes could signify diversification potential.

Auer and Schuhmacher then went on to compare risk-adjusted performances of the original world portfolio without a diamond index and one with the diamond index. They found that the incorporation of a diamond index within the investment portfolio could indeed enhance portfolio performance. Of the 10 diamond indices, the best risk-reducing performance is given by the 1.0 carat mixed diamond index.

The difference in findings between Renneboog and Spaenjers (2012) and Auer and Schuhmacher (2013) was possibly due to data. Renneboog and Spaenjers used proprietary data provided by auction houses Sotheby's and Christie's covering 3952 auction sales in the period 1999-2010. Using data from auction sales could potentially subject the analyses to the Veblen effect (goods that are desired for being over-priced). This could potentially explain why they found a positive correlation between diamonds and stock market returns. Further, related research done by Heyman, Orhun and Ariely (2004) on auctions also found that opponent and quasi-endowment effects might result in over-bidding.

Auer and Schuhmacher used data from PolishedPrices. The 10 diamond indices used were constructed based on different weights (0.3, 0.5 and 1.0 carats) and quality classifications (fine, commercial and mixed) to reflect the grade and applications of diamonds in that class. The final index was the overall diamond index.

Our research used proprietary daily data from 15 of the most significant participants by annual sales in the global diamond trade and spans the period Jan 2012 to August 2015. Our proprietary data set focused only on investment grade diamonds in 3 groups of sizes (0.3, 0.5 and 1.0 carats); this is similar to the size groups used by Auer and Schuhmacher. In each size group, the diamonds are further categorized by colour and clarity. Only colourless or near colourless diamonds were used to construct these price indices (grades E, F and G). For clarity, only “Very Very Slightly Included” (VVS1, VVS2) and “Very Slightly Included” (VS1) grades of diamonds were used for the price indices.

Apex clarity grades such as FL and IF and colour grade D were not used as their rarity created large gaps in the time series where no frequent transactions took place, making it difficult to run analyses with other

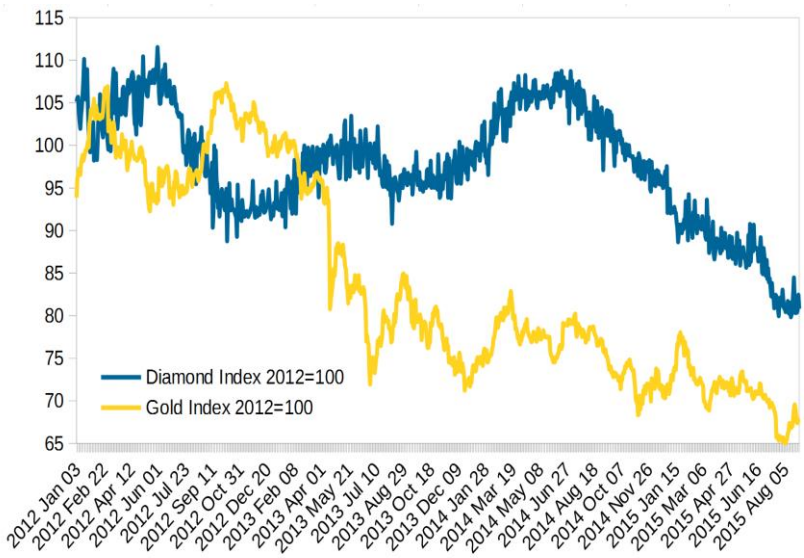
asset classes. All in all, a total of 28 price indices with daily prices in that period yielded 26,768 observations. The 28th index was the overall volume-weighted index (weighted by carats transacted in 2012) of each of the prior 27 groups. These 27 groups also correspond to the 27 product categories that are available for trading on SDiX. Figure 1 below shows the computed volume-weighted diamond index, which was then used to run correlation analyses with other asset classes and to construct the efficient frontiers comprising optimised portfolios. The gold index is included in Figure 1 to show the relative performance of another precious commodity over the same time period.

The largest gem-quality diamond rough ever found to date is the Cullinan diamond, unearthed in January 1905 in South Africa. The rough originally weighed 3,106.75 carats and was cut into 105 polished gems. The largest is the Cullinan I, also known as the Great Star of Africa, which weighs 530.2 carats, while the second largest Cullinan II (the Lesser Star of Africa) weighs 317.4 carats. Both gems are in the Crown Jewels of the United Kingdom.

The 9 largest pieces after the rough was split. *Source: Famous Diamonds*

Source: GIA

The Sovereign's Sceptre, originally made for the coronation of King Charles II in 1661, was redesigned in 1910 after the discovery of the Cullinan Diamond, and set with the 530.2 carat Cullinan I. The diamond can be removed and worn as a brooch.



Source: Bloomberg, SDiX

Figure 1 – Diamond Index and Gold Index (2012=100)

The research results from our data set corroborated with the findings of Auer and Schuhmacher. In general, we found that diamonds had low or negative correlations with other asset classes. The diversification benefits that diamonds accorded when included in global portfolios were also able to improve the efficient frontier, leading to enhance risk-adjusted returns.

2.2 CORRELATION MATRIX OF DIAMONDS VERSUS OTHER ASSET CLASSES

Many research pieces have been written covering alternative investments and how the addition of such investments can lead to a more efficient and more diversified portfolio. A recent research article

written by Citibank (2015) covered the fine art market. In that research report, fine art as an asset class was compared against financial assets and other alternative assets such as real estate, private equity and hedge funds.

We opted not to include some of these alternative assets as these asset classes can be highly fragmented and an over-arching representation of that asset class may not be available or prove useful. For example, if one were to invest in real estate, would it be through REITs or physical property? If it were the latter, would it be in the US, Japan, Europe or all of the above?

We chose to work with well-known global indices as the component asset classes for our global portfolio. Below is the list of the indices:

- Nikkei 225
- CRB Commodities
- USD Index
- SDiX Proprietary Diamond Index
- US Treasury 10Y
- MSCI Emerging Markets
- JPM EMBI Global Total Return
- S&P 500
- EuroStoxx 600
- US Corporate Bond
- EU Corporate Bond
- Gold Spot

THE GRAFF PINK DIAMOND

The 24.78 carat Graff Pink diamond, which held the previous auction record for any diamond, sold at US$46.2million at a Sotheby's Geneva auction in November 2010.

Source: Sotheby's

The Fancy Intense Pink diamond was once owned by jeweller Harry Winston. It was bought by diamond dealer Graff Diamonds at the auction, who named it The Graff Pink.

	Nikkei 225	CRB Commodities	USD Index	Diamond Index	US Treasury 10Y	MSCI Emerge Mkts	JPM EMBI	S&P 500	EuroStoxx 600	US Corp Bond	EU Corp Bond	Gold Spot
Nikkei 225	1	0.12	-0.44	0.10	0.74	0.76	0.93	0.95	0.87	0.66	0.89	0.09
CRB Commodities	0.12	1	-0.35	-0.39	0.08	0.44	-0.01	0.03	0.83	-0.06	0.08	0.64
USD Index	-0.44	-0.35	1	0.48	-0.09	-0.72	-0.50	-0.50	-0.77	-0.59	-0.73	-0.68
Diamond Index	0.10	-0.39	0.4770	1	0.18	-0.27	0.05	0.05	-0.40	-0.08	-0.08	-0.47
US Treasury 10Y	0.74	0.08	-0.09	0.18	1	0.39	0.54	0.73	0.76	0.05	0.48	-0.26
MSCI Emerge Mkts	0.76	0.44	-0.72	-0.27	0.39	1	0.78	0.79	0.84	0.74	0.84	0.62
JPM EMBI	0.93	-0.01	-0.50	0.05	0.54	0.78	1	0.91	-0.19	0.84	0.94	0.14
S&P 500	0.95	0.03	-0.50	0.05	0.73	0.79	0.91	1	0.92	0.69	0.90	0.13
EuroStoxx 600	0.87	0.83	-0.77	-0.40	0.76	0.84	-0.19	0.92	1	-0.66	0.89	0.49
US Corp Bond	0.66	-0.06	-0.59	-0.08	0.05	0.74	0.84	0.69	-0.66	1	0.85	0.40
EU Corp Bond	0.89	0.08	-0.73	-0.08	0.48	0.84	0.94	0.90	0.89	0.85	1	0.32
Gold Spot	0.09	0.64	-0.68	-0.47	-0.26	0.62	0.14	0.13	0.49	0.40	0.32	1

Source: Bloomberg, SDiX

Figure 2 – Correlation Matrix of the Diamond Index with other Asset Classes

One of the key benefits of using well-known global indices together with our diamond index is that the correlation analyses can be later applied directly into portfolio construction. In other words, with these correlation results, an actionable portfolio can be easily created using products structured on these indices and SDiX's products.

In general, the diamond index is found to have low or negative correlations with global developed and emerging market equities. This is similar to the results found in Auer and Schuhmacher (2013). Against fixed income indices, the diamond index is mostly uncorrelated or mildly negatively correlated. Against commodities such as Gold and the CRB commodities index, the diamond index is moderately negatively correlated. When compared with the USD, the diamond index is moderately positively correlated.

These correlation results suggest that the addition of diamonds even to an already well-diversified portfolio can yield further diversification benefits and lead to better risk-adjusted returns. With this in mind, we proceeded to construct globally diversified portfolios and the efficient

frontiers, first without diamonds and subsequently with the addition of diamonds.

2.3 EFFICIENT FRONTIERS WITH AND WITHOUT DIAMONDS

Our objective here is simple. We assume that we have a given amount of money to invest, and we want to select the "best" portfolio of assets in a manner that trades off the expected returns and the risk. Investing all our money on assets that are heavily correlated may yield great returns, but this is subjected to great risk.

Investment in a different (not perfectly correlated, possibly even negatively correlated) asset can mitigate this risk. This idea is known as diversification in investing, but the concept of "never put all your eggs in one basket" has been known to man for centuries (one of the first recorded appearance in literature is an 18th century translation of Cervantes' Don Quixote[1]). We now formalize the concepts discussed above.

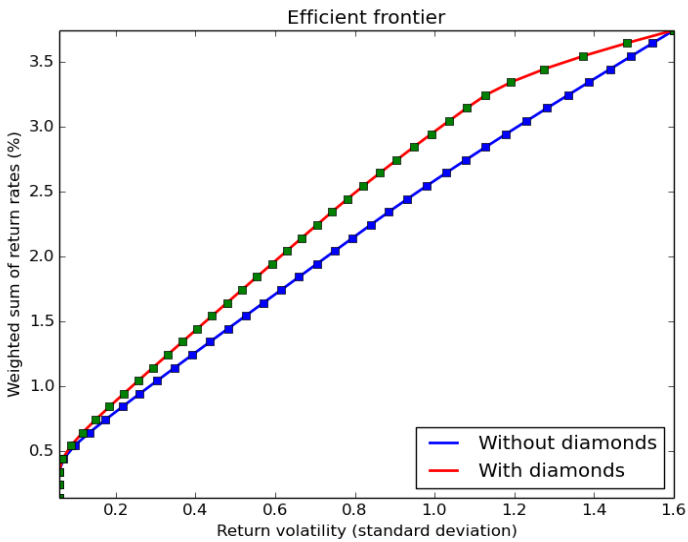
"Diversification into diamonds helps to increase returns for the same level of risk"

Essentially, the choice of the assets in the optimal portfolio does not depend on the size of the investment; we are only interested in finding the optimal relative composition of the portfolio. Clearly we have a

1 *"Tis the part of a wise man to keep himself today for tomorrow, and not venture all his eggs in one basket"*

huge number of possible portfolios to choose from. However, not all of them are desirable. A portfolio is considered efficient if it has the maximum expected return among all portfolios with the same variance, or alternatively, if it has the minimum variance among all portfolios that have at least a certain expected return. The collection of efficient portfolios forms the efficient frontier of the portfolio universe.

We apply Markowitz's (1952) mean-variance optimization model to the problem of constructing an optimal portfolio consisting of twelve assets, using historical return data to estimate their future expected return. The actual performance of our portfolio depends on unforeseeable factors; here we assume that the historical data may be enough to capture the trend of these assets under consideration. In particular, we assume that the rates of return of the assets are random variables whose expected value and variance can be determined using historical data.



Source: SDiX

Figure 3 – Efficient Frontiers with and without Diamonds

In Figure 3 above, we draw the efficient frontiers for two different portfolios - one portfolio considers a combination of the twelve assets indicated above, while the other portfolio considers a combination of only eleven assets and in particular excludes diamonds.

Clearly, diversification into diamonds helps to increase returns for the same level of risk, and because diamonds are weakly correlated to many of the other assets under consideration, investing in diamonds improves the robustness of the portfolio and pushes out the efficient frontier.

3. COST OF CARRY – WHAT IT IS AND WHY IT MATTERS

Cost of carry is the cost associated with storing a physical commodity or holding a financial instrument over a defined period of time. Carrying charges include insurance, storage costs, interest charges on borrowed funds, and other related costs. As carrying costs can erode the overall return on an investment, due consideration should be given to them in considering the suitability of the investment, and also while evaluating investment alternatives.

The cost of carry for diamonds is a fraction of that for traditional commodities like oil and metals due to their size and handling process. They are stored within insured vaulting facilities throughout the world, mainly in free trade zones, through custodians in high-end logistics. Storage costs and handling are a fraction of the cost (as a percentage of value) of other commodities. There are no excess logistics costs as they are easily stored and transported, unlike other bulky commodities like oil, metals or grains.

For example, the cost of carry for diamonds through SDiX is approximately 1.5bps per month[2]. In comparison, the storage fees of copper on the LME are 120bps per month[3].

Even amongst similarly regarded assets like precious metals, the storage of physical gold in an exchange like Comex, the cost of carry is still almost four times [4] more expensive (5.5bps/month) when compared with diamonds stored with SDiX.

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2 Excluding cost of funds

3 Based on the following and excluding cost of funds: A) LME FOT Rates = $40/mt (cost for warehouse to load/unload). B) LME Rent Rates = $0.45/mt per day = $13.5/mt per month. C) $53.5 is one month's cost / $4,400 (current price of copper) = 1.2%

*4 Based on the following and excluding cost of funds: A) CMX Monthly Storage Fees per kg = $6.50. B) CMX deliver out fees per kg = $12.50. C) $19 is one month's cost / $34,496.95 (current price $1073/oz * 32.15oz) = .055% /month*

4. HOW SDIX CAN BENEFIT INVESTORS

The current lack of price transparency in the diamond market makes it hard for market participants to properly assess their investments. Institutional players such as banks and funds or non-institutional players like individual investors find it difficult to enter into the diamond market despite the potential advantages of investing in diamonds.

In addition, the lack of a pricing benchmark or a discovery platform makes hedging or trading difficult. Without reference prices, tracking a diamond's current value, and something basic like marking to market one's investment can prove challenging. A lack of price transparency exists across all stages of purchasing, from wholesale trading to retail markup.

"SDiX offers a standardised price discovery and trading platform that is regulated to industry standards"

As well as barriers to entry, market participants are also faced with exit barriers. Due to illiquid and opaque secondary markets, there is a disposal or resale cost associated with transacting in these secondary markets.

There is currently no effective way to get investment exposure to diamonds. One option to gain exposure to diamonds is to invest in publicly traded diamond-mining companies such as Rio Tinto, Anglo American, Dominion, and Alrosa, as proxies. This, however, also exposes investors to the companies' capital expenditure on new projects, exploration, insurance, inventory and manpower costs.

Another easy way to gain exposure would be to purchase retail diamond jewelry. As diamond jewelry is highly personalised to one's taste, a sale could involve significant markdowns, which impacts returns.

Despite these difficulties, the use of diamonds as investments is growing in popularity, which is increasing demand for a trusted price discovery platform. Of course, with the evolution of digitisation and online sales, the transparency of diamond prices will eventually improve; however there is no timeline for this and if it does happen, there will still be issues with the accuracy of online unregulated information.

SDiX offers a standardised price discovery and trading platform that is regulated to industry standards, enabling the trading of diamonds with the same ease as other asset classes. By improving entry and exit channels, SDiX offers the first platform to give investors direct exposure to diamonds without the corporate risks of mining companies or the illiquidity of diamond jewelery.

SDiX lists "investment grade" diamonds[5] that are colourless or near colourless whose clarity is only Very Slightly Included (VVS) or Very Slightly Included (VS) across 3 different size baskets.

SIZE \ COLOUR	E	F	G
0.3 carat	VVS1, VVS2, VS1	VVS1, VVS2, VS1	VVS1, VVS2, VS1
0.5 carat	VVS1, VVS2, VS1	VVS1, VVS2, VS1	VVS1, VVS2, VS1
1.0 carat	VVS1, VVS2, VS1	VVS1, VVS2, VS1	VVS1, VVS2, VS1

5 All diamonds listed on SDiX have the same properties: Excellent grade in cut, polish, symmetry; No fluorescence; No BGM.

These diamonds offer the most liquidity, and by standardising products with specific criteria, SDiX has created a way for diamonds to be fungible.

This is the first and most crucial step to establishing a liquid two-way market. Over time, this will bring down the bid-offer spread of diamonds closer in line with other commodities. In turn, this will lower the cost to enter and exit investments in diamonds.

4.1 EXCHANGE VS OVER-THE-COUNTER

An exchange ecosystem provides numerous benefits to investors compared to OTC markets.

First, SDiX provides a centralized trading system. Unlike OTC markets where transacted prices are not typically available, SDiX provides full price transparency for all diamond prices quoted or traded on the platform. Unlike in many OTC markets, the sources of these prices also remain anonymous.

Second, SDiX enforces safeguards against certain trading practices, including market manipulation. This is a key differentiator for SDiX, and ensures that the integrity of the market is maintained.

THE WITTELSBACH-GRAFF DIAMOND

Source: GIA

The 31.06 carat Wittelsbach-Graff is one of the largest historic blue diamonds ever fashioned. The diamond belonged to the Bavarian House of Wittelsbach and was displayed in the Treasury of the Munich Residence until it disappeared in 1931. It was “rediscovered” in 1961, and then sold again in 1964 to an undisclosed private buyer.

In December 2008, the diamond was sold at Christie’s London to jeweler Laurence Graff for just over US$24.5million.

SDiX has also implemented procedures that limit damage during adverse market conditions, reducing the risk of default of its members. These procedures include the application of security deposits, trading limits, and circuit breakers. This differs from trading in OTC markets, where market participants are exposed to these risks and the credit risk of their counterparties.

Third, SDiX has been designed to meet the global regulatory standards for a commodities exchange. There are formal mechanisms to ensure market stability and integrity to safeguard the collective interests of market participants and prevent fraudulent firms from entering the exchange marketplace.

Fourth, products traded on the exchange are standardised. This means that all products traded on the exchange match the specifications of quantity, quality and identity stipulated by the exchange. This standardisation also extends to trade execution, where an identical methodology and process is applied across all transactions concerning the respective products. In the OTC markets, product, price and execution quality can vary, leading to settlement issues.

5. HOW TO TRADE ON SDIX

SDiX provides the market with a transparent platform for trading of physical diamonds for spot delivery.

Clients[6] wishing to access the market must do so through an SDiX member. You can apply to become a member or find an existing member to trade through. Prospective users of the exchange can be assured they are dealing with professional, recognised, and experienced firms. Members need to meet minimum financial requirements and abide by SDiX rules.

Participants can trade in one of our two sets of products: either diamond baskets or single stones. All SDiX diamond baskets are traded in contracts representing 3.1 carats, and single stones are traded in contracts representing an individual diamond. SDiX contracts allow all in the diamond supply chain, including investors, to hedge or take on price risk to underlying diamond price movement.

SDiX has implemented standard exchange-based technology delivered by MarketGrid Systems. The SDiX system deploys highly evolved, tried-and-tested architecture, with a matching engine that provides complete infrastructure for automated trading including execution, settlement, and a separate depository system, which are coupled with the Exchange's surveillance and regulatory requirements.

SDiX will use both continuous matching in basket trading and negotiated matching in single stone trading, and will establish the first continuous price/ time priority matching for the diamond industry, identical to that used in other global commodity exchanges. True price

6 *Client eligibility to participate is subject to the SDiX Exchange Rules*

discovery will be achieved through real-time full order-book depth and market data available to all participants in real time.

A global network of approved vaulting facilities, as well as Approved Suppliers to the Exchange, underpins the SDiX trading and price discovery functions. The SDiX network of approved vaulting facilities initially extends to Singapore and Mumbai, and each location must meet strict criteria before being approved for SDiX usage. SDiX has a set of criteria for Approved Suppliers to ensure that every contract is of a certain quality. Only Approved Suppliers can deliver to the exchange, and only diamonds that meet the Exchange's Product Specifications can be accepted for trading on the Exchange. Traded diamonds are immobilised in the approved vaulting facilities as part of the Exchange ecosystem. Buyers may re-sell or physically withdraw their diamonds post-settlement.

The physical settlement of diamonds through SDiX Depository and payout of funds into the seller's accounts occur on Trade Date plus 3 business days.

Source: Lucara Diamond

Lucara Diamond Corp. found a 1,111 carat rough in the Kerowe Mine in Botswana in November 2015, along with the discovery of two other large diamonds of 813 and 374 carats in the same week. The 1,111 carat rough is the second diamond in history weighing more than 1,000 carats that has been found. The large stone is estimated to be worth at least US$60million.

6. SINGLE STONE INVESTMENT CASE

Earlier, we spoke of SDiX having two sets of products – 27 baskets and single stones. In this section, we revisit academic literature to see the effects of including single gems into an investment portfolio instead.

Auer (2014) expanded on his earlier work with Schuhmacher to compare directly the performance of diamond indices with that of gold and silver. Auer found that the two precious metals offered better performance based on the Sharpe ratio of weekly returns in the time period observed. Of the diamond indices, Auer found the 1.0 carat class to yield the highest returns but nevertheless still found lower risks in a well-diversified diamond portfolio compared to straight investments in precious metals.

Low, Yao and Faff (2015) added Rhodium to the existing precious metal group (Silver, Gold, Palladium and Platinum) and high quality physical diamond prices to their analyses. Low, Yao and Faff found that that 1.0 carat D flawless diamonds stood out as a strong hedge and as a safe haven asset. During the global financial crisis of 2008, the authors found that the price of 1.0 carat diamonds experienced the least volatility and in particular, 1.0 carat D flawless diamonds rose in price when financial markets collapsed.

The authors found that physical diamonds provided satisfactory performance when markets are the most volatile and should be included in a portfolio for their downside hedging potential. A strong negative correlation is seen in top quality flawless diamonds and international equity markets. Hence, one of the key advantages of holding top quality physical diamonds is that they continue to have a strong store of value, providing price stability and possibly even appreciation during periods of market turmoil.

That said, larger stones (those defined as 1.0 carat and above) have different behavior in the marketplace compared to that of smaller stones. Because of their rarity and infrequent transactions, they have a different risk/return profile.

In November 2015 diamond prices had been quoted in Bloomberg as being down 17% year-to-date. Yet, in the same month, the Blue Moon achieved the highest price for a diamond at US$48.5million, which was also the highest price per-carat on record.

Larger and rare stone pricing is more analogous to the high-end art market, where infrequent trades and unique pricing determinants can cause greater variability in outcomes and risks.

Despite the above, larger stones still carry key characteristics of a store of value asset as well as diversification benefits. Through the introduction of standardized exchange trading methodology on the SDiX platform, diamonds can truly be recognized as a rising asset class.

7. CONCLUSION

The polished diamond investment industry continues to evolve with increasing transparency, amidst the steady accumulation of wealth in emerging markets. Being a precious commodity, diamonds can act as a store of value, as well as a hedge against inflation. Currently, physical diamonds as investments represent only 3% of annual production, whereas gold is at 40% and silver at 20% of annual production, providing upside potential for demand. The value of diamonds as a rare commodity will only make it more attractive as an investment and a valuable addition to any portfolio.

8. ACKNOWLEDGEMENTS

8.1 REFERENCES

Auer, B. R. 2014, Could diamonds become an investor's best friend? Review of Managerial Science 8 (3), 351-383

Auer, B. R., Schuhmacher, F., 2013. Diamonds - A precious new asset? International Review of Financial Analysis 28, 182–189.

Bain & Company, The Global Diamond Report 2013 and 2014.

Barclays, 2012. Profit or Pleasure? Exploring the motivations behind treasure trends. Barclays Wealth and Investment Management

Bloomberg, 2015. Diamonds Aren't Forever for Botswana as Mining Boom Fades Away.

Citibank, 2015. Monday Mining Minutes: Gold, Diamonds and Art, 16 November 2015, 5-14.

Heyman, J. E., Orhun Y. and Ariely, D., 2004. Auction fever: The effect of opponents and quasi-endowment on product valuations. Journal of Interactive Marketing Vol 18 / No. 4 / Autumn 2004.

Low, R. K. Y., Yao, Y. and Faff R., 2015. Diamonds vs. Precious Metals: What shines brightest in your investment portfolio. UQ Business School, University of Queensland, Brisbane, 4072, Australia

Markowitz, H., 1952. Portfolio Selection. The Journal of Finance, Vol. 7, No. 1. , 77-91.

Renneboog, L., Spaenjers, C., 2012. Hard assets: The returns on rare diamonds and gems. Finance Research Letters 9 (4), 220–230.

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