



Financial Innovations and Sustainable Development

Professor Michael Mainelli & Simon Mills
Z/Yen Group Limited
41 Lothbury
London EC2R 7HG
United Kingdom

October 2016

Abstract

This paper argues that financial systems are tools that can aid achieving the Sustainable Development Goals, yet also need to exhibit sustainability of their own. Some specific innovations that might provide disproportionately large benefits for sustainability include:

- financial measurement:
 - confidence accounting – representing financial information in its true form as ranges would help highlight the value of reducing uncertainty and the importance of SDGs over the long-term;
 - mutual distributed ledgers (aka blockchains) – provide a solid underpinning to the registries society uses in all areas and enable communities to work together without creating ‘natural monopolies’ over information;
- monetary systems:
 - digital fiat currencies – governments using digital currencies may gain much greater control over their monetary systems, reduce corruption, and have more effective tax systems;
 - common tenders – community monies of many forms could be a major boost to specific community values and encourage credit creation among trust groups;
- financial technology:
 - identity – systems in use for financial services could transform much wider areas of government, health, and qualifications for approximately 2.4 billion people, especially in providing access to other property rights;
 - peer-to-peer lending & insurance – these tools are engaging communities and providing better assessments of risk and reward from people ‘on the ground’;
 - mobile money – this innovation is bringing access to banking and finance services to millions of the world’s poorest people, who until recently did not have access to these services.
- financial structure:
 - policy performance bonds – these mechanisms have great potential in aligning financial incentives with wider SDGs;



Financial Innovations and Sustainable Development

- land value taxation – in combination with extensive tax reform, i.e. not just another tax, could simplify tax systems and encourage sustainable development.
- disaster reinsurance – a combination of reinsurance and catastrophe bonds could help to ensure longer-term investment and returns-on-investment in risky areas.

While, perhaps with the exception of digital fiat currencies, these innovations are already here, they are often ignored or unevenly implemented. This paper concludes that, of all the innovations discussed, providing identity systems for the 2.4 billion people without legal identity is a single tool that could transform all areas of sustainable development.

Contents

Overview	3
What Is ‘The Financial System’?	3
How Do Financial Services And Systems Affect Sustainable Development?	6
Would A Sustainable Financial System Contribute To The Sustainable Development Goals?	7
What Impact Will Current And Future Innovation In Financial Systems And Services Have On Sustainable Development?	7
Financial Measurement Innovation	9
Confidence Accounting	9
Mutual Distributed Ledgers (MDLs, aka blockchains)	10
Monetary System Innovation	13
Digital Fiat Currencies	13
Common Tenders	14
Financial Technology Innovation	18
Identity	18
Peer-to-Peer Lending & Insurance	21
Mobile Money	22
Financial Structure Innovation	25
Policy Performance Bonds	25
Land Value Taxation	27
Disaster Reinsurance & Foreign Aid Catastrophe Bonds	27
Conclusion	31
APPENDIX 1 - Sustainable Financial Systems & Delivery Of The Sustainable Development Goals	32
APPENDIX 2 – Other Suggested Areas of Financial Services Innovation	34
Internal Growth Rates	34
Discount Rates	34
Sustainability Approximates	35
Cryptocurrencies	37



Financial Innovations and Sustainable Development

Quantitative Easing, Helicoptering Money, and Universal Income.....	37
Narrow or ‘Utility’ Banking.....	38
Capital Controls.....	38
Digital Wealth Management.....	40
Crowd-funding	40
Algorithmic and High Frequency Trading (HFT)	40
Securitisation	42
Investment & Client Categorisation – General, Green, and Social	44
Consumption Taxes	45
Pigouvean Taxes.....	45

Overview

The Business and Sustainable Development Commission aims to articulate and quantify the economic case for business to advance the Sustainable Development Goals (SDGs) by 2030. The Business and Sustainable Development Commission commissioned a paper from Z/Yen Group Limited on financial innovations and their impacts on sustainable development which should:

- assess what recent and future financial innovations mean for sustainable development – including both financial technology innovations and financial structure innovations;
- explore the implications of these innovations for sustainable development on both the upside and the downside, and make recommendations for ways of harnessing financial innovations to maximise sustainable development outcomes and to minimise risks, e.g. exploring risk/reward restructuring, self-organisation, economic incentives for achieving the SDGs, etc.;
- to the extent possible, map both analysis and recommendations out against the ‘six systems’ that the Commission intends to use as a core analytical lens, i.e. land, energy, cities, knowledge, health & wellbeing, and materials.

This report explores the implications of these innovations for sustainable development, identifies key challenges associated with each area, and makes initial recommendations on how risks can be minimised and sustainable outcomes encouraged.

What Is ‘The Financial System’?

The financial system enables the exchange of funds between lenders, investors, and borrowers. In theory, by directing effort and resources through monetary motivation, the financial system should encourage people to trade. Trade in turn should reward comparative advantage and specialisation, thus raising productivity and efficiency.

The financial system has four core roles in providing:

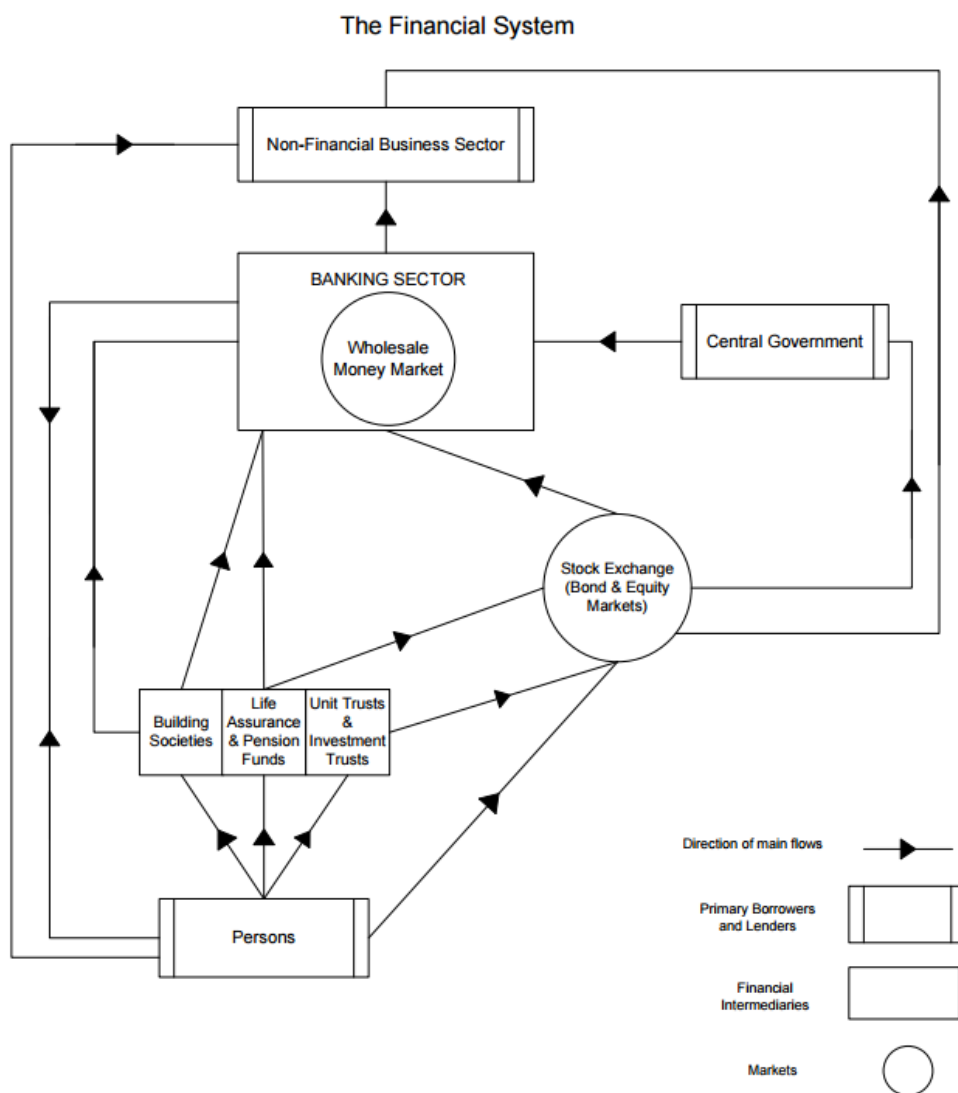
- safe custody for assets;
- a payments system;
- intermediation between savers and borrowers;
- risk reduction (insurance).



The financial system consists of a number of groups of actors, in particular:

- consumers – who make payments, borrow, and save;
- corporations (and similar economic entities) – who make payments, borrow and save;
- investors – who commit funds to direct or indirect investments with the expectation of financial returns – e.g. corporate investors, asset managers, lenders;
- traders – who buy, sell and make markets in securities;
- guarantors – who insure or re-insure project or corporate operations and risks;
- financial services firms – who operate payment systems, manage aggregation vehicles, and assist with mergers & acquisitions;
- professionals and financial sector workers – ranging from accountants, actuaries, lawyers, bankers, insurers, wealth managers, investment advisors and other professionals to the wider workforce of the financial services industry;
- governments – who issue fiat currency (the basis of modern monetary systems), regulate financial services (most especially banking leverage, but also consumer protection, market integrity, and competition), and control the taxation system.

The following schematic outlines the financial system:



Source: Adapted from *How the City of London Works*, William M. Clarke, (2008) 7th Edition

Investors, especially those with a long-term investment horizon such as institutional investors, increasingly recognise that SDGs have a material impact on longer-term risks and returns. However, the integration of SDG-related risks into investment assessments remains limited, due in part to the need for:

- additional tangible evidence of investment returns correlating with SDGs;
- comprehensive, standardised corporate reporting processes to allow access to comparable data on corporate performance in managing SDGs;
- improved methodologies to incorporate SDG risk assessments into financial reporting processes.

Guarantors' integration of SDG aspects into insurance policies, beyond accidental pollution events, is recent and primarily driven by regulatory developments such as the implementation of the EU Environmental Liability Directive (ELD). Guarantors' data requirements involve large volumes of historical and scientific data necessary to assess the



range and scale of risks involved, particularly when developing insurance products for a new asset class such as SDG.

Currently, SDG risks in the context of the ELD are assessed as part of the underwriting process, based on location-specific biological and geographical data available in the public domain (through Google Earth or habitat databases). Insuring SDG risks also requires the ability to price these risks, highlighting the need for further work on valuation methodologies to help quantify SDG risk and the guarantors' potential exposure.

Corporations, particularly those with a heavy stake in SDG, are starting to recognise that the sustainable management of SDG exposure is beneficial for long-term prosperity. Integrating SDG risks and opportunities into corporate planning and decision-making processes makes sound business sense. However, industries are faced with significant data and methodological challenges due to both the spatial variability of SDG attributes/environmental conditions, and a lack of agreed sector-specific indicators and methodologies. As a result leading corporations tend to engage with scientific research centres and specialist consultants to meet specific research needs and to develop tools and methods tailored to their needs.

How Do Financial Services And Systems Affect Sustainable Development?

In February 2016 the United Nations Environment Programme published a report on the design of a sustainable financial system which *“serves the long term needs of a healthy real economy, an economy that provides decent, productive and rewarding livelihoods for all, and ensures that the natural environment on which we all depend remains intact and so able to support the needs of this and future generations.”*¹ The report identified four criteria that identify whether a financial system is contributing to sustainable development:

- the encouragement of long-term investment;
- reflection of pricing signals and risk;
- the encouragement of development and growth;
- resilience to shocks.

Using these criteria as a yardstick, the following observations can be made:

- financial systems are failing to encourage long-term investment. Despite negative interest rates in most OECD countries, there is a significant gap in infrastructure finance.² While Gross Domestic Fixed Capital Formation (GDFCF) fell as a proportion of GDP fell between 2007 to 2012 across the G7 economies³.
- financial systems are failing to effectively reflect pricing signals and risk – financial systems do not routinely take account of environmental costs or environmental limits. Four out of nine “planetary boundaries” have been crossed: climate change, loss of biosphere integrity, land-system change, and altered biogeochemical cycles⁴.

¹ UNEP 2016- Imagining a Sustainable Financial System http://unepinquiry.org/wp-content/uploads/2016/02/Imagining_a_Sustainable_Financial_System.pdf

² World Economic Forum 2014- *Strategic Infrastructure Steps to Operate and Maintain Infrastructure Efficiently and Effectively* http://www3.weforum.org/docs/WEF_IU_StrategicInfrastructureSteps_Report_2014.pdf

³ C Driver & Paul Temple 2013- Capital Investment: what are the main long term trends in relation to UK manufacturing businesses, and how do these compare internationally? https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/283884/ep8-capital-investment-trends-uk-manufacturing.pdf

⁴ W Steffan 2015- *Planetary Boundaries - an update* <http://www.stockholmresilience.org/21/research/research-news/2015-01-15-planetary-boundaries---an-update.html>



- financial systems are failing to encourage development and growth - there is a funding gap of approximately US\$3.5 trillion for SMEs in developing economies⁵. UNCTAD estimates that there is a US\$2.5 trillion annual investment gap in developing countries to meet the post-2015 goals.
- financial systems have not increased their resilience to shocks. According to the seven key factors that influence system resilience, financial systems resilience has declined since 2000 across all G8 countries, with the UK having the least resilient financial services⁶.

Would A Sustainable Financial System Contribute To The Sustainable Development Goals?

Sustainable Development and sustainable financial systems are not the same thing. Sustainable Development is an approach to development that attempts to balance different, and often competing needs, against an awareness of the environmental, social and economic limitations we face as a society. The financial services system's most important role is the allocation of financial capital between different economic activities.

Innovation has a problematic role in society and finance. Historically, major technology innovation comes with enormous wastage. Waste can come in the form of war (from which sprang radar, computing, the jet engine, antibiotics, and rocketry), or in the form of a financial bubble (such as the canals, railways, the internet, or financial credit and property bubbles).

A sustainable financial system can be defined as one which encourages investment (the action or process of investing money for profit) enhances rewards, reduces risk and increases certainty over the long-term. However, this sustainable financial system may exclude or reduce the incentives for technological innovation by seeking to avoid waste. A sustainable financial system will aid achieving the 17 Sustainable Development Goals, but will not deliver it alone.

What Impact Will Current And Future Innovation In Financial Systems And Services Have On Sustainable Development?

A financial system consists of institutional units and markets that interact for the purpose of mobilizing funds for investment and providing facilities, including payment systems, for financing commercial activity. Jeff Bezos, founder of Amazon.com, is reported to have said that technology creates new markets in two distinct waves⁷. The first wave of 'shallow change' sees companies simply automating the old way of doing things, improving productivity and cutting costs. 'Deep change' comes as a second wave of innovation when companies find that new technology allows them to create completely new processes, so-called 'Uber moments'.

⁵ "Two Trillion And Counting: Assessing The Credit Gap For Micro, Small, And Medium-Size Enterprises In The Developing World", McKinsey/IFC (2010)
<http://www.ifc.org/wps/wcm/connect/3d5d09804a2d54f08c1a8f8969adcc27/Two+trillion+and+counting.pdf?MOD=AJPERES>

⁶ NEF 2015 *Financial System Resilience Index Building a strong financial system*
http://b3cdn.net/nefoundation/70470851bfaddff2a2_xem6ix4gg.pdf

⁷ <http://www.cnet.com/uk/news/caveat-venditor-seller-beware/>



Over the past few years, the disruptive effects of technology have meant that the financial services sector has embraced innovation in technology, services, platforms and, to some degree, systems. The pace of change in financial services appears to insiders to be accelerating and there is a perception that traditional models for financial services may be under threat, but so far it appears as yet to be ‘shallow change’. Accenture predicts that full-service banks could lose approximately 35 per cent of their market share by 2020⁸ to ‘Pure Plays’ – whether online or mobile – and up to 25 per cent of US banks could disappear completely during that same period.

Significant structural challenges have drawn the focus of policy makers and regulators, at both the international and national level, to systemic market failures particularly around;

- information asymmetries - a seller knows more about an item than the buyer. Likewise, a borrower knows more about their financial condition and future prospects than a lender.
- agency problems - conflict of interest is inherent in a relationship where one party is expected to act in another's best interests, but has a financial stake in the outcome. For example a company's management will want to maximise their remuneration and job security while a company's stockholders will want to maximise returns.
- inappropriate competition or lack of competition - monopolies distort markets through the control of the supply of or trade in a commodity or service. Oligopolies (where a market structure is dominated by a few firms) reduce competition and lead to rigid prices, barriers to entry and inefficiency. Yet one country's monopoly may be within a globally competitive sector.
- externalities - these are consequence of an industrial or commercial activity which affects other parties without this being reflected in market prices. The failure to charge for carbon and other greenhouse gas emissions is an ‘externality’. Nicholas Stern⁹, states that “Climate change is the biggest market failure the world has ever seen.”

Financial services institutions operate within frameworks of policy, regulation and standards. Financial services are among the most fluid and international of industries. In an increasingly global world, there are frequent conflicts between local, national, regional, and international standards in finance. For example, conflicting requirements in USA mortgage and insurance regulation between states. Or conflicting European Union requirements on data protection. Or conflicts between USA and European regulators over the USA's Foreign Account Tax Compliance Act. Conflicts and systemic failures have caused some policy makers and regulators to call for regulation at a global systems level. However, supra-national regulation may impede innovation (e.g. would M-Pesa have emerged under Western regulation?) and development (e.g. recent anti-money laundering regulations have seriously affected remittances to poorer nations from their overseas workers).

⁸ Accenture 2013 *Banking 2002* https://www.accenture.com/us-en/~/_media/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Industries_3/Accenture-Banking-2020-POV.pdf

⁹ The Stern Review on the Economics of Climate Change http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm



Financial Measurement Innovation

This section highlights innovations in measuring and monitoring financial management and economic progress at a company, national and international level, which have the potential to have a significant positive impact on sustainable development.

Confidence Accounting

Confidence Accounting uses distributions, rather than discrete values, in auditing and accounting statements. The proposed benefits of Confidence Accounting include a fairer representation of financial results, shorter and fewer footnotes in company reports, measurable audit quality and a mitigation of mark-to-market perturbations¹⁰. One clear benefit of confidence accounting, when it comes to sustainable development, is its enhanced ability to factor in extra-financial issues and their potential impact on company performance.

Benefits of Confidence Accounting

Characteristic	Deterministic Problem	Confidence Accounting
Relevance		
predictive value	wide ranges require a single number	the range is fully described
feedback value	the single number is wrong 99.9% of the time and discussion centres on whether it was close enough	clear discussion on whether results fell within predicted ranges and if not, why was the certainty factor wrong
timeliness	much discussion and prevarication in choosing a single number	prompt presentation of the “way things are” and ability to see convergence over time
Reliability		
verifiability (objectivity)	difficulty in obtaining consensus among different measurers	ability to incorporate different measurers when necessary
neutrality	difficulty in changing standards without affecting certain sectors, e.g. stock options and high-tech companies, or leases and property companies	reduction in the number of special standards needed to reflect practices in certain sectors
representational faithfulness	poor agreement between real world and measures	accurate reflection of real world phenomena

For example, the ‘stranded assets’ debate, i.e. the realization that valuations of fossil fuel assets in aggregate assumed that all atmospheric CO2 ppm targets would never be met,

¹⁰ Ian Harris, Michael Mainelli and Jan-Peter Onstwedder, “Confidence Accounting: A Proposal”, Chartered Institute for Securities & Investment, Long Finance, Association of Chartered Certified Accountants (July 2012), 66 pages.



would have been highlighted by Confidence Accounting. Confidence Accounting would also provide information that would help to assess the impact of future perceived volatility reduction on investments. The basic analytical approach is to use option theory to estimate the value lost through future perceived volatility and then use that value to justify corporate social responsibility investments.¹¹

Mutual Distributed Ledgers (MDLs, aka blockchains)

Mutual distributed ledgers (MDLs, aka blockchains) provide pervasive, persistent, and permanent records. MDL technology securely stores transaction records in multiple locations with no central ownership. MDLs allow groups of people to validate, record, and track transactions across a network of decentralised computer systems with varying degrees of control of the ledger. Everyone shares the ledger. The ledger itself is a distributed data structure held in part or in its entirety by each participating computer system.

MDLs are logically central, but technically distributed, enabling organisations to work together on common data. They act as if they are central databases where everyone shares the same information. However, the information is distributed across multiple, or multitudinous, sites so that no one person can gain control over the value of the information. Everyone has a copy. Everyone can recreate the entire market from someone else's copy. However, everyone can only 'see' what their cryptographic keys permit them.

MDLs have the potential to transform the role of central (or 'trusted') third parties. People use central third parties in many roles in finance, for settlement, as custodians, as payment providers, as poolers of risk. Central third parties perform three roles:

- validate - confirming the existence of something to be traded and membership of the trading community;
- safeguard – preventing duplicate transactions, i.e. someone selling the same thing twice or 'double-spending';
- preserve – holding the history of transactions to help analysis and oversight, and in the event of disputes.
- MDLs might substitute for two roles of a trusted third party, preventing duplicate transactions and providing a verifiable public record of all transactions.

Trust moves from the third-party to the technology. MDLs and blockchain architecture are essentially messaging protocols which can work as well as a hub-and-spoke for getting things done, but without the liability of a trusted third party in the centre which might choose to exploit the natural monopoly or collude in corrupt practices.

Emerging techniques, such as smart contracts (embedded code) and decentralised autonomous organisations, might in future also permit MDLs to act as automated agents. Smart contracts can store promises to pay and promises to deliver without having middleman or exposing people to the risk of fraud. The same logic which secured 'currency' in bitcoin can be used to secure little pieces of detached business logic. Smart contracts may automatically move funds in accordance with instructions given long ago, such as a will or a futures contract or crop insurance. For pure digital assets there is no 'counterparty risk' because the value to be transferred can be locked into the contract when

¹¹ Michael Mainelli, "Ethical Volatility: How CSR Ratings and Returns Might Be Changing the World of Risk", Balance Sheet, The Michael Mainelli Column, Volume 12, Number 1, Emerald Group Publishing Limited (January 2004), pages 42-45.



it is created, and released automatically when the conditions and terms are met: if the contract is clear, then fraud is impossible, because the program actually has real control of the assets involved rather than requiring trustworthy middle-men like ATM machines or car rental agents. Of course, such structures challenge some of our current thinking on liquidity and, implementations have been, so far, frail.

MDLs can be applied to a wide variety of ‘trust’ applications including registries (land, ships, aircraft, tax, artworks, fishing quotas, etc.), identity (registries identity documents and qualifications), chain-of-custody (diamonds, forestry products, fish, etc.), health information, or voting (e.g. corporate voting).

Summary Section 1

While the issue of measurement is often considered a dry and academic topic, what gets measured and how it gets measured is a vitally important issue. We measure the things that are important to us - if a government or corporation fails to measure a significant social or economic indicator, it is a sure sign that managing that aspect of its performance is not a policy priority.

Decisions about the management of populations, public services, security, and the environment are increasingly being made using ‘big data’ - extremely large data sets that can be analysed computationally to reveal patterns, trends, and associations. Though often described as ‘raw,’ this data is produced by techniques of measurement that are imbued with judgments and values that dictate what is counted and what is not, what is considered the best unit of measurement, and how different things are grouped together and “made” into a measureable entity.









In the words of Kathleen Pine and Max Liboiron in “The Politics of Measurement and Action”, *“The power and politics of measurement via leaving things out is further complicated by how the interplay of inclusion and exclusion makes things. Measurements create certain possibilities for action and exclude other possibilities; this is why it is crucial to examine not only the politics underpinning the design of measurements, but how measurements are linked to action, carrying the interests of their designers into the world.”*¹²

Confidence accounting and MDLs may be particularly important in helping deliver SDGs.. The second as it allows investors to make better assessments of financial performance, taking into account the volatility that failure to meet SDGs increases. The second because of its inherent power to break central third party monopolies. MDLs also provide the ability to record basic data for long periods, allowing us to change our higher-level measurement as circumstances change.

¹² Pine, K. H., & Liboiron, M. (2015). “The Politics of Measurement and Action.” In Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems, ACM: 3147-3156.



Financial Measurement Innovation & Sustainable Financial Systems

	Confidence Accounting	Mutual Distributed Ledgers
Summary	Clarity of presentation of non-financial issues affecting distributions aids more effective strategy and planning.	A potentially effective tool for transparent reporting, registries and anti-fraud protection
Encourage long-term investment		
Reflect pricing signals and risk		
Encourage development and growth		
Increased resilience to shocks		

Key



Positive Impact



Neutral Impact



Negative Impact



Monetary System Innovation

This section examines innovations in the fields of currency, money, and monetary systems which have the potential to support the delivery of SDGs.

Communities are groups of people prepared to be indebted to one another. Money is a technology communities use to trade debts across time and space. Governments have a monopoly on the use of force within a defined geographic area. This monopoly gives rise to a semi-coercive community. In broad terms, the dominant money technology, fiat money, is government issued tax credits. Governments issue tax credits for future repayment in order to achieve their ends. People trade these tax credits. For the most part (the US\$ aside), tax credits diminish in value the further they get from the jurisdiction of the issuing governments, or diminish in value when the future viability of the tax system is in doubt, for example due to armed conflict or poor tax enforcement. Graziani¹³ provides three conditions for defining money:

- money involves a token currency (otherwise it would be barter and not monetary exchange);
- money has to be accepted as a means of final settlement of the transaction (otherwise it would be credit and not money);
- money must not grant privileges of seignorage (a profit made by issuing currency) to any agent making a payment.

Currency is a generally accepted form of money, issued by a government and circulated within an economy to be used as a medium for the exchange of goods and services¹⁴. A monetary system is the mechanism by which a government manages the circulation of currency in a country's economy. It usually consists of a mint, central bank, and commercial banks¹⁵. A wrinkle in the monetary system is the privileged role of banks. In most economies anyone can borrow or lend, but only banks can lend a multiple of their capital, often ten to twenty times their capital. In most economies, bank issued loans have 'created' over 90% of the money in issue.

Digital Fiat Currencies

Fiat currency (representing fiat money) typically uses an intrinsically worthless technology, such as paper money, that is deemed to be money by law [aside: note that fiat currency notes with serial numbers constitute one form of non-electronic mutual distributed ledger]. Fiat currencies are controlled by central banks who decide when to print and distribute money. A number of central banks around the world are considering issuing digital fiat currency to cut costs across the payment system and give authorities more control over their money supply. To date no central banks have taken this step, but they are considering different types of technology that would enable them to do so.¹⁶ The Bank of England has been at the forefront of the debate, seeming to imply that digital fiat currency may be inevitable, though not imminent.

¹³ A Graziani 1990. *Economies et Societes, Mondial et Production. The Theory of the Monetary Circuit*
<http://cas.umkc.edu/econ/economics/faculty/wray/601wray/graziani.pdf>

¹⁴ <http://www.investopedia.com/terms/c/currency.asp>

¹⁵ <http://www.businessdictionary.com/definition/monetary-system.html>

¹⁶ R Tracey 2015. The Wall Street Journal. *A Digital Currency for Central Bankers*

<https://www.ecurrency.net/static/news/201512/Central-Bankers-Response-Bitcoin-Own-Digital-Cash-WSJ-print.jpg>



The implications of digital fiat currencies are enormous. Digital fiat currencies have great potential to counter fraud. Payments made to working mothers may stay with them to spend rather than being taken by a partner. Social benefits might apply restrictions on gambling or drink consumption. For the first time macro-economists would know the velocity and quantity of money accurately enough to validate their theories. Taxation could be highly innovative, with locational taxes, or direct transaction taxes, almost an infinite variety. On the other hand, digital fiat currencies raise enormous concerns about privacy (the state could know, on certain implementations, everything you spend), appropriation (instant taxation and appropriation could fatally weaken the idea of private ownership of currency quickly), complexity, and cyber-failure. The power to introduce creative taxation approaches rapidly could seem capricious and be highly disruptive to an economy.

Common Tenders

The majority of business-to-business trade uses money in the form of fiat currencies. However, companies and governments also conduct trade by exchanging goods for goods. WTO estimates that perhaps 25% to 40% of global trade is ‘non-monetary’. Direct trade or ‘barter’ is considered less efficient than monetary trade as it requires both parties to have matching wants and needs at the same time. To overcome this difficulty, trade can be made possible by using a mutual credit system (or common tender) that is only redeemable in goods and services, not fiat currency.

Mutual credit brings participants back to the system to redeem their credit since it is typically not redeemable for cash, though common tender can be used either in whole or part as a means of exchange. To this end “capacity exchanges” can be defined as *“membership-based systems within which companies can trade available capacity in the form of goods, services and infrastructure within and across industries, using common tender as a medium of exchange”*¹⁷

Technological advances are allowing this type of B2B exchange to become easier thus enhancing the potential to develop at scale. While capacity exchanges are more common among SMEs in local or national trading networks, recently larger multinational reciprocal trade systems have become more prominent, as one of the attractions of common tender arrangements is that they are less affected by currency fluctuations.

An interesting, and long-standing, example is the Swiss WIR Bank and the WIR multilateral exchange. WIR is a cooperative bank facilitating multilateral trading between, and extending credit to, member SMEs. Founded by 16 entrepreneurs in 1934, the WIR Wirtschaftsring-Genossenschaft (economic circle cooperative) was set up as a result of the adverse economic and monetary conditions resulting from the Great Depression. It was conceived as a way to stimulate trade and create purchasing power between participants, primarily SMEs, thereby enabling local economic growth and reducing unemployment.

Since its inception, the WIR economic circle has undergone a number of reforms and structural changes and now resembles a commercial bank driven by cooperative interests

¹⁷ City of London 2011 Summary Findings RESEARCH REPORT Capacity Trade and Credit: Emerging Architectures for Commerce and Money http://www.cityoflondon.gov.uk/business/economic-research-and-information/research-publications/Documents/research-2011/Capacity%20Trade%20and%20Credit%20Summary%20Findings_web.pdf



Financial Innovations and Sustainable Development

(favouring SMEs and local/national economic growth and with strong economic foundations). For example, it went from issuing interest-free credit to providing credit lines at advantageous rates compared to market rates (approximately 1.75% for members); and from charging a 'demurrage' (or penalty) fee to members holding on to their WIR francs (CHW) to simply not paying interest rates on CHW deposits, thereby encouraging constant money circulation.

WIR Bank performs different and complementary functions to a normal bank. First, it acts as a 'central bank' issuing its own currency pegged to the Swiss franc (CHF) and released to members through loans and mortgages backed by collateral. The CHW comes into being on the strength of the contract with the borrower plus the willingness of a community to accept the money as a payment for goods and services, rather than through state/central bank authorisation. The bank regulates the amount of CHWs in circulation - CHWs accounted for 0.2 % of CHF M1 in 2009; it also defines the rules of participation and the usage of WIR credits, e.g. WIR credit cannot be redeemed for Swiss francs; and sanctions members for illegal behaviour through exclusion, e.g. such as discounted market trading of CHWs for Swiss francs.

Second, it acts as a 'commercial bank' and as such has been subject to relevant banking regulations in Switzerland since 1936 when it was first given the status of a bank. In this capacity, WIR bank provides a range of banking products (including business loans and mortgages) to its clients in Swiss francs, WIR credits or a combination of both. CHWs are used by participants to exchange goods and services within the WIR exchange. Since every WIR credit is matched by an equal and opposite debit, the system as a whole must net to zero.

Third, WIR bank acts as a 'trade facilitator' by providing the WIR platform or system through which WIR members can exchange goods and services with each other using the CHW as a partial or full means of payment. In this context, WIR bank also provides a range of marketing and communication services (e.g. web listings, WIR fairs) and advisory services (e.g. workshop, advice on the set-up of a WIR budget) to members to enable them to trade within the system. The WIR system is also supported by independent local members' groups (e.g. Groupement WIR Suisse Romande) that act as local networking and discussion forums throughout Switzerland.

Today, circa one in five SMEs in Switzerland is a WIR member, resulting in over 60,000 SMEs trading with each other within the WIR system, of which one third are from the construction industry. The value of CHW-based transactions represents circa 0.3% of Swiss GDP. Prices are denominated in Swiss francs and can be paid using WIR credits, Swiss francs or a combination of both. While some participants accept CHWs as 100% of the payment for their goods and services, the minimum rate of CHWs for every transaction is 30% up to a value of 3,000 CHF; and subject to agreement between the parties beyond that threshold. The average rate of acceptance is usually between 30% and 40% of the total amount. Through partial acceptance, participants meet costs and liabilities that cannot be met through WIR credits such as salaries, tax and social contributions. As a result, trading within the WIR system results not only in an increase in turnover in WIR credits but also in Swiss francs.



Summary Section 2

While the years following the 2008 financial crisis saw a great deal of libertarian speculation about the end of fiat currencies, the extreme volatility of crypto-currency markets, combined with the inability of crypto-currencies to fulfil a primary purpose of currency - the settling of tax debts, means that the end of fiat currency is not in sight.










Using 56 years of WIR data on participants, CHW in circulation, turnover and credit, Stodder (2009)[13] demonstrated the counter-cyclical nature of WIR credit, showing that WIR credits are most likely to be accepted when ordinary money is in short supply and suggesting that the purchasing power created through WIR could become an instrument of effective macroeconomic stabilisation.

The use of common tenders may enhance growth rates in developing economies, particularly at SME level. Common tenders and local currencies may benefit from technological innovation crossing over from cryptocurrencies and MDLs. Common tenders are now easier and safer than ever to set up, and there is a tremendous amount of experimentation ahead.

^[13] Stodder, "Complementary credit networks and macroeconomic stability: Switzerland's Wirtschaftsring," 82.



Financial Systems Innovation & Sustainable Financial Systems

	Digital Currencies	Common Tenders
Summary	No central bank has yet issued digital fiat currency;	Potential to encourage development and growth, particularly amongst SMEs.
Encourage long-term investment	 	
Reflect pricing signals and risk		
Encourage development and growth		
Increased resilience to shocks		

Key



Positive Impact



Neutral Impact



Negative Impact



Financial Technology Innovation

This section examines technology-driven innovations in financial services which support sustainable development.

The principal technological force has been information & communications technology (ICT). The overall progress summary would be ‘smarter, cheaper, faster’, but also ‘ubiquitous, sensing and recording’, and ‘smarter’. Some types of innovation could disrupt the current structure of the financial services sector. Others will extend the reach of financial services to include individuals in developing economies who are currently unbanked and uninsured. Others will extend financial services to new areas.

Identity

Identity is a fundamental enabler for innovation and trust in financial services. About 2.4 billion people worldwide lack official identification, about 1.5 billion over the age of 14. A large proportion of these are women. While they certainly know who they are, they are excluded from market economy property ownership, and frequently free movement, social protection, and empowerment. They cannot ‘prove’ their existence to the satisfaction of society’s registries. Lack of official identification increases remittance costs, corruption, and crime. Insightfully, United Nations Sustainable Development Goal 16 “Peace, Justice And Strong Institutions” contains target 16.9 to “provide legal identity to all, including birth registration, by 2030”.

Hernando de Soto, the Peruvian economist famous for his work on the informal economy and property rights, states: “Without an integrated formal property system, a modern market economy is inconceivable.”¹⁸ Property rights require the rule of law and registries of property owners. More pointedly, without personal identification a modern market economy is inconceivable, not least because without identification there are no holders of property rights.

Recent advances in biometric security - from fingerprint and iris scanning, to DNA analysis and voice pattern recognition are likely to play an important part in securing the future of mobile banking, yet identity is not just physical, a DNA or retinal match. Identity is not just about ownership of bank accounts or assets. Our identities are the ‘chains of our lifetime’, binding us past and future with the now. For example, your school grades, driving record, tax payments, and health records are all part of a chain of historical behaviour entangled with your particular human body. Future ‘bindings’ might include school loans, financial obligations, and other commitments including our ‘wills’. Our identities encompass our relationships with other people and institutions. Our identities vary depending on who is identifying. The tax office probably has little interest in your driving record, but may care enormously about the days you spent out of the country.

Over the past several years, banks have withdrawn from remittance markets in developing countries, citing too much difficulty and fines for not complying with developed world know-your-customer and anti-money-laundering (KYC/AML) requirements. Perhaps

¹⁸ “The Mystery Of Capital: Why Capitalism Triumphs In The West And Fails Everywhere Else”, Black Swan [2001], page 172.



contrarian banks should seek to excel at providing identity and payments in the harshest conditions of war-torn or lawless countries, but so far none have led.

At the other end of the spectrum, high-net-worth individuals (HNWI) in the developed world struggle too with the plethora of bureaucracy and paperwork involved in KYC/AML regulation. Onerous KYC/AML is an obstacle to trade, thus reducing the benefits of comparative advantage and specialisation. Financial institutions waste time and money on KYC/AML for little avoidance of money laundering or fraud. Some institutions estimate losses post 'sale' at up to 40%, with customers refusing to put up with overly bureaucratic procedures and failing to proceed with previously agreed financial services.

Two inexorable trends increase the tensions in identity, globalisation and population. With the rise of internet-enabled financial services and mobile banking, the issue of identity has become the source of new risks for both individuals and institutions. Over the last decade cybercrime and identity theft has changed from a cottage craft to a multi-billion dollar industry committed by perpetrators who are not only highly organised, highly skilled, and well resourced, but are often supported by covert state institutions seeking to exploit points of weakness in national infrastructure. In a globalised world approaching ten billion people, transactional affordability is crucial to success. Sure, a few individuals can afford complex and costly identity schemes, but can developed country financial service providers ponderously insist on using slow and costly systems to exclude large markets full of future customers?

HNWI KYC/AML hassles for the wealthy and their financial institutions is a world away from the quotidian toils of the 'great undocumented', but the solution to their problems may be similar, MDL (aka blockchain) technology. MDLs are open registers that allow groups of people to validate, record, and track transactions across a network of decentralised computer systems. The ledger itself is a distributed data structure held in part or in its entirety by each participating computer system. The computer systems follow a common protocol to add new transactions. The protocol is distributed using peer-to-peer architecture. The persistence and pervasiveness of distributed ledgers make them ideal for providing a lifetime records. The fact that they are held in common, mutual, means that they are hard to exploit as natural monopolies.

Though such ledgers are over two decades old, the poster child for MDLs has been the blockchain ledger of Bitcoin. Bitcoin's ups-and-downs have given it fame and notoriety, but they have also proved the integrity of a blockchain ledger in harsh conditions. However, there are thousands of ways to build MDLs and many alternatives are available.

MDL identity schemes could empower people with personal data storage and management, permission frameworks for access by third parties such as banks insurers or governments, and even distributed reputation ratings. Such applications could reduce financial fraud, costs, and crime, and increase returns, confidence, and security. The concept of never losing data could materially alter the way society views identity, privacy, and security.

Governments are setting up innovative digital identity systems and authentication processes. Tellingly, since 2007 Estonia has been operating a universal national digital identity scheme using blockchains and has extended it to non-nationals. Though not based on blockchains, since inception in 2009 the Unique Identification Authority of India has issued over 1 billion 12 digit identity numbers covering 85% of the population so far. Gov.UK Verify in September 2014 proposed a public services identity assurance programme using a network



of trusted and vetted third party providers instead of relying on a centralised database. There are also some interesting proposals on low-cost, emergency identity systems, such as Vinay Gupta and Re.silience.com's "State In A Box".¹⁹ More radical proposals include moving from national identity systems to independent global systems such as BITNATION.²⁰

In a private system, there are typically three parties: the subject, an individual; the certifier, an organisation notarising documents; the inquisitor, an organisation conducting KYC/AML checks on the subject. An identity certifier might be a government, an accounting firm, a credit referencing agency. Typically there are two distinct MDLs, a content ledger holding the documents individually encrypted, and a transaction ledger holding the encryption keys on a series of 'key rings'. The subject can give the certifier permission to put digitally certified documents on their key rings. The subject can give copies of the keys to inquisitors. The system can restrict the number or the timing of inquisitor examinations and records all inquisitions for the subject. The system meets such data protection standards as the 'right to be forgotten' and location of data storage. The subject 'owns their own data' and serves as the conduit, when needed, for communication between inquisitors and between certifiers, in full control.

Consider the identity certifier as a 'co-stamper' of data onto a personal or corporate 'chain'. The owner of the chain can include what they like, pictures of the cat even, but if they wish to get other people to accept the data's validity, it needs co-stamping. A simple example might be that your accountancy firm needs to co-stamp the inclusion of your annual report on your corporate identity chain before other parties would normally accept it. Another example might be that you go to an identity certifier to encode your DNA, retinal scan, and photo, thus time-stamping your identity. Certifiers have no further access to the data. However, you can share the key to your identity chain with other people and organization who will rely upon the fact that the data has been co-stamped by a trusted third party.

"The way law stays alive is by remaining in touch with social contracts pieced together among real people on the ground."²¹ At a time where access and control over one's own data is becoming increasingly sensitive, empowering individuals to store, update and manage access to their data seems rather obvious. Transaction costs will drive a 'many uses' approach to get the most out of an expensive process. Both high-net-worth customers and low-net-worth customers expect global identity, whether it is payments, credit, government records, health records, or academic qualifications. Their demands will get stronger as they realise what can be achieved, rather than what has historically been foisted upon them. They will bypass service providers with onerous identity rituals. 'Many uses' will in turn drive consolidation towards a few, competitive, global systems. Identity sovereignty could make a huge difference to remittances and global access to credit markets.

¹⁹ <http://guptaoption.com/4.SIAB-ISA.php> (retrieved 28 July 2016).

²⁰ <https://bitnation.co/> (retrieved 28 July 2016).

²¹ Hernando de Soto, "The Mystery Of Capital: Why Capitalism Triumphs In The West And Fails Everywhere Else", Black Swan [2001], page 112.



Peer-to-Peer Lending & Insurance

Traditionally, banks had a monopoly on loans, taking in deposits, and extending loans with the margins being made by charging borrowers higher rates on interest than those offered to savers.

However peer-to-peer lending networks are squeezing these margins and offering better rates to savers and borrowers. Platforms like LendingClub and Prosper in the US and Funding Circle, Wellesley & Co and Zopa in the UK have exploded in popularity, since the financial crisis due to bank's caution approach to extending credit to small businesses.

Peer-to-peer lenders ascribe their success to effective risk management systems based on innovative data capture. For example Kabbage (<https://uk.kabbage.com/>) use eBay and Amazon daily sales volume and ratings, UPS, QuickBooks and Yodlee use Yelp and Facebook reviews to assess credit risk. The result is ultra-rapid decisions on loans combined with highly competitive rates.

As a result peer-to-peer lending has very rapidly in the last couple of years. Figures from the Peer-to-Peer Finance Association indicate that over £95 million of Net Lending Flow (NLF = New lending - Capital repaid) was extended to SMEs in the UK in the final quarter of 2015²².

Peer-to-peer lenders typically allow investors to earn interest rates of between 5pc to 6pc. However, this is not banking and these are not savings accounts, and while in the UK peer-to-peer lenders point to default rates of around 2.5% and claim to have systems in place to mitigate against investor losses, these schemes are not covered by the Government-backed Financial Services Compensation Scheme, which protects bank savers up to £75,000. To this end, it is not known how investors would fare should there be another financial shock which pushed default rates higher.

Furthermore, internationally there have been examples of fraud on a massive scale - In February, Chinese authorities arrested 21 people involved with the country's largest peer-to-peer lending service, Ezubao, which was accused of conducting a Ponzi scheme which defrauded more than 900,000 investors out of 50 billion yuan (£5.3 billion)²³.

However, peer-to-peer lending networks have immense potential to re-energise the microfinance community and provide access to loans for SMEs in developing economies. Peer-to-peer micro-lending platforms, such as lendwithcare, Lendico and RainFin (49% of which is owned by Barclays Group Africa) have proved popular, both with investors and borrowers²⁴.

The insurance sector experienced early disruption by Fintech, and the disappearance of high street insurance brokers can be directly attributed to the rise of call centres and later internet comparison sites. More recent examples of FinTech intrusion in the day-to-day lives of insurance customers are the proliferation of 'black boxes' placed inside motorists' cars, the

²² <http://p2pfa.info/data>

²³ <http://www.independent.co.uk/news/business/news/china-arrests-peer-to-peer-lenders-ezubao-in-8bn-ponzi-scheme-a6847066.html>

²⁴ <https://www.compuscan.co.za/will-peer-to-peer-lending-revolutionise-the-credit-industry/>



development of wearable technology such as FitBit and internet connected household appliances.

However, in developing economies two developments have the potential to extend insurance cover to the vulnerable - peer-to-peer insurance and peer-to-peer derivatives. Peer-to-peer insurance is similar to peer-to-peer lending. Peer-to-peer insurance offers the potential for lower cost insurance through a shareconomy approach. Policy owners with the same insurance type form small groups. A part of their premiums is paid into a cashback pool. If no claims are submitted, the members of the group get some of their money back at the end of the year. In case of claims, the cashback decreases for everyone. Small claims are settled with the money in the pool. Bigger claims are settled via standard insurance and if there is insufficient money left in the pool to cover a claim, stop-loss insurance covers the rest. The benefit of this approach is that moral hazard decreases as individuals are less likely to make fraudulent claims if they will be taking money from friends and neighbours. Examples of organisations using this approach include Heyguevara, Friendsurance and Lemonade. [<https://heyguevara.com/>, <http://www.friendsurance.com/>, and <http://www.lemonade.com/>]

Derivatives are already used in the form of crop yield insurance in developed economies. Traditional agricultural insurance schemes are known to be plagued by problems of asymmetric information and systemic risk²⁵. Promotion of weather derivatives in developing economies is being undertaken by a number of international organisations working in partnership with national governments. The World Bank has undertaken pilot programmes in Nicaragua, Morocco, Tunisia, Ethiopia, India, Ukraine, Malawi, Peru and Mongolia²⁶. Fintech, in particular, the application of mobile platforms, remote sensing and modelling has the potential to allow groups of farmers or small businesses access to this product. Peer-to-peer insurance and the use of derivatives have the potential to extend insurance cover to some of the world's poorest people, greatly enhancing resilience to disasters and vulnerability to hunger and famine.

Mobile Money

One of the greatest global developmental challenges is tackling the issue of financial inclusion. The World Bank estimates that approximately 2 billion adults do not currently have access to bank accounts²⁷, with the majority of these individuals living in institutionally poor economies in the global south. While access remains a significant challenge, the World Bank reports a startling 20% drop in the number of 'unbanked' individuals over the last five years.

According to a recent Euromoney²⁸ paper this may, in part, be ascribed to the innovative use of mobile phone technology. In Uganda, more people have mobile money accounts than have conventional bank accounts. Mobile phone operators are taking advantage of low costs to derive profits from large volumes of low value transactions, which would not be

²⁵ A Stoppa and U Hess 2003 International Conference on Agricultural policy reform and the WTO Design and Use of Weather Derivatives in Agricultural Policies: the Case of Rainfall Index Insurance in Morocco.
<http://siteresources.worldbank.org/INTCOMRISMAN/Resources/rainfallmoroccocopy.pdf>

²⁶ S Bush 2012 Derivatives and Development: A Political Economy of Global Finance, Farming. Palgrave McMillan

²⁷ World Bank 2014 *The Global Findex Database* http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/10/19/090224b08315413c/2_0/Rendered/PDF/The0Global0Fin0ion0around0the0world.pdf#page=3

²⁸ <http://www.euromoney.com/Article/3547134/Emerging-markets-Fintech-for-the-unbanked.html?copyrightInfo=true>



profitable for traditional banks. The result is a ‘shadow’ banking system, which in many ways mirrors traditional banking systems. In Tanzania, providers of digital financial services have established a compatible payment system, which enables customers of different providers to transact with each other. In Kenya 93% of the adult population is registered with provider M-Pesa and 60% of the population actively use the service.²⁹ The result has been explosive growth and the proportion of the adult population with a financial account grew from 12% in 2009 to 50% by 2014.

This boom in Fintech consumer finance has perturbed traditional banks. While many are responding by setting up their own fintech incubators and buying out promising start-ups³⁰, there is disquiet that financial regulators do not have oversight of these new providers and their customers may be less protected³¹.

Access to financial services enables consumption smoothing and reduces the poor’s vulnerability to income volatility. It also enhances gender equality by giving women direct access to the financial system. Access to a bank account also enables investments in health, education and income generating activities, according to the University of London³².

Microtransactions is a term that applies to small value financial transactions. While the term is commonly associated with the purchase of apps or media, it also applies to small payments for goods and services in the real economy. Near Field Communication is a contactless connectivity technology that enables short-range communication between two devices. NFC is based on RFID (Radio Frequency Identification) standards. An increasingly important use of NFC is making small payments with their smartphones or contactless debit or credit cards.

Summary Section 3

Innovation may be, in the short-term, negative, e.g. the automation of back office functions may have a human cost in white-collar job losses in financial services in developing economies. However, the longer-term impacts from new products such as mobile money and peer-to-peer products may liberalise financial services. The most fundamental contribution of financial technology innovation towards SDGs may be giving people official identification, thus enabling them to participate in economic activity and democracy.

²⁹ http://www.safaricom.co.ke/images/Downloads/Resources_Downloads/Half_Year_2013-2014_Results_Presentation.pdf#page=13

³⁰ <http://www.euromoney.com/Article/3547134/Emerging-markets-Fintech-for-the-unbanked.html?copyrightInfo=true>

³¹ <http://www.scmp.com/business/article/1918084/fintech-boon-unbanked-nightmare-regulators>

³² Pande R, Cole S, Sivasankaran A, Bastian G, Durlacher K (2012) *Does poor people’s access to formal banking services raise their incomes?* EPPI-Centre, Social Science Research Unit, Institute of Education, University of London



Financial Technology Innovation & Sustainable Financial Systems

	Identity	Peer-to-peer Lending & Insurance	Mobile Money
Summary	Advances in identity technology will accelerate developments in the fintech space.	Highly effective tool for the mobilisation of community resources, limited by lack of internet access	Highly effective way to extend services to the “unbanked” in developing economies.
Encourage long-term investment	+ -	✓	+ -
Reflect pricing signals and risk	✓	✓	✓
Encourage development and growth	✓	✓	✓
Increased resilience to shocks	+ -	+ -	✓

Key



Positive Impact



Neutral Impact



Negative Impact



Financial Structure Innovation

This section examines future innovations in financial structures, including instruments and taxes, which have the potential to support sustainable development.

Policy Performance Bonds

Policy performance bonds (PPBs) are government or corporate issued bonds where interest payments are linked to the delivery of policy specific targets. Policy performance bonds, or surety bonds, could be an important link between government policies and real-world economies. A policy performance bond provides a hedge against the issuing country's government not delivering on its commitments or targets.³³ Policy performance bonds could help unite businesses, organizations, and governments towards shared goals.

For example, energy projects share similar risks. Universal risks include energy prices, construction costs, operating costs, efficiency, waste and decommissioning. But there is one qualitative difference between traditional fossil fuel energy projects and clean tech energy projects, the risk of failed government policy. Government policy is core to most clean tech profitability. If governments stick to declared targets for reduces greenhouse gas emissions, renewable energy, or carbon prices, many clean tech projects make investment sense. If government policies are hot air, clean tech projects are highly risky. Call this the risk of government inaction.

A government carbon policy performance bond could provide a hedge against the issuing country's government not delivering on its commitments or targets. The ability to hedge enables the same investor to invest more confidently in projects or technologies that pay off in a low-carbon future because if the low-carbon future fails to arrive the government too bears direct costs of having to pay higher interest rates on government debt. Government carbon policy performance bonds eliminate the one risk that differentiates clean tech projects from other energy projects, the uncertainty of government policy actually being directed at a low carbon future. Examples of potential indices that address this unique risk are:

- levels of greenhouse gas emissions;
- levels of feed-in tariffs for renewable energy or percentage of renewable energy in overall energy supply;
- prices of emission (reduction) certificates in a trading system;
- levels of taxes on fossil fuels or fossil fuel end-user prices.

Eventually, if the bonds are actively traded, simple derivatives would allow potential investors in low carbon projects or technologies to obtain a hedge against government risk without having to physically purchase the government bond itself. Derivatives would broaden the appeal to investors prohibited from buying government debt, for example those whose investment mandate stipulates they must invest in low carbon projects only. More complex versions are possible. A developed country could issue the bond but use an index

³³ M Mainelli and J Onstwedder Environmental Finance, Fulton Publishing (February 2010) page 17 *Living Up To Their Promises (index-linked carbon bonds)*



of a group of developing countries weighted average feed-in tariffs for clean energy, for example, so transferring the risk of those governments' policies from a private sector investor to the develop country's government.

The choice of index allows the public sector to eliminate quite specific risks, taking away a policy confidence blockage and enabling private sector investment to flow. The ability to choose any of a range of indices provides flexibility to target one or more specific risks in a single structure. Government carbon policy performance bonds could easily be issued by any government (supra-national, national, state, province) or multi-lateral agency without any need for a global initiative. Documentation would be simple. Most existing government treasury mandates already allow for these types of instrument.

It is not necessarily all public sector. Private sector companies might issue policy performance bonds, or be required to do so, for example against pollution targets for air or water. Equally a government might issue a bond, say for NOx levels, that pays less interest as pollution levels rise, and force automotive or transportation firms to buy them.

Governments could issue debt linked to other areas they control, branching out from inflation and carbon targets to education, healthcare or crime, or SDGs. If these markets grew, they would transform corporate risk management and give a new twist to public-private partnership. Companies might locate our corporate facilities in deprived areas (poor education rates, high murder or crime rates) and hedge the risks with government debt (education quality bonds, crime-linked bonds). There are certainly complexities, such as auditing and authentication of government figures, liquidity, leverage opportunities, stripping, etc., however the idea of a deep market in SDG policy performance bonds seems worth serious consideration.

Goal	Policy Performance Bond Examples
1	End poverty in all its forms everywhere <ul style="list-style-type: none"> • unemployment target bonds • minimum household income bonds
2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture <ul style="list-style-type: none"> • nutritional supplement bonds • import percentage bonds
3	Ensure healthy lives and promote well-being for all at all ages <ul style="list-style-type: none"> • antibiotic resistance bonds • obesity bonds • drug use bonds
4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all <ul style="list-style-type: none"> • apprenticeship bonds • PISA bonds
5	Achieve gender equality and empower all women and girls <ul style="list-style-type: none"> • female educational attainment bonds • quota target bonds
6	Ensure availability and sustainable management of water and sanitation for all <ul style="list-style-type: none"> • flood bonds • water purity and availability bonds



7	Ensure access to affordable, reliable, sustainable and modern energy for all <ul style="list-style-type: none"> • alternative energy percentage bonds • energy delivery or 'coverage' bonds
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all <ul style="list-style-type: none"> • GDP bonds • export value-added bonds, custom bonds
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation <ul style="list-style-type: none"> • road network bonds • broadband coverage bonds
10	Reduce inequality within and among countries <ul style="list-style-type: none"> • maternity 'life' bonds • GINI index bonds
11	Make cities and human settlements inclusive, safe, resilient and sustainable <ul style="list-style-type: none"> • crime reduction bonds • air quality bonds
12	Ensure sustainable consumption and production patterns <ul style="list-style-type: none"> • recycling target bonds • biomass bonds
13	Take urgent action to combat climate change and its impacts <ul style="list-style-type: none"> • CO2 emission bonds • CO2 sequestration bonds
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development <ul style="list-style-type: none"> • fish stock quality bonds • desalination bonds
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss <ul style="list-style-type: none"> • forestry coverage bonds • pesticide consumption bonds
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels <ul style="list-style-type: none"> • corruption index bonds • court case time bonds
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development <ul style="list-style-type: none"> • any regional or global SDG attainment policy performance bond

Land Value Taxation

Land Value Taxation (LVT) is a method of raising public revenue by means of an annual charge on the rental value of land. In this context 'land' means the site alone, not counting buildings or improvements. LVT is favoured by economists because there can be no supply response - the quantity of land remains unchanged, and if the market for land is efficient, no



transactions would be deterred or encouraged. LVT would create enormous incentives for the sustainable use of land.

In theory LVT would also be a very efficient source of public revenue, as all land would make a full contribution to the Exchequer, allowing reductions in existing taxes on labour and enterprise. Furthermore, it would reduce avoidance and evasion as land cannot be hidden, removed to a tax haven or concealed in an electronic data system.

LVT would also encourage economic growth as it would deter speculative land holding thus encouraging landowners to develop vacant and under-used land properly or sell it. However, any LVT would have to be designed to reflect the conservation or environmental services value (e.g. flood prevention) use of undeveloped land.

To date, no nation has imposed a pure LVT (though some split LVTs have been used for municipal taxes). The biggest barrier to their adoption is political, as LVTs would impose costs on landowners, traditionally the wealthiest and most powerful citizens, who would lobby strenuously against their adoption. Most initiatives have been turned down as theoretically desirable, but high practical challenges in setting initial valuations, moving the tax burden initially from occupiers to landowners, and the likely disruption in transition.

Disaster Reinsurance & Foreign Aid Catastrophe Bonds

It is the world's poorest who suffer most significantly from natural and man-made catastrophes. These are the people least likely to hold insurance, (70% of economic losses resulting from are from those uninsured³⁴) and their suffering is likely to increase over the course of the century as man-made climate change increases the magnitude and frequency of events.

The London Markets Group (a body representing the specialist commercial (re)insurance broking and underwriting communities in London) has proposed the development of a Foreign Aid Catastrophe Bond (FACB)³⁵, designed to enhance the resilience of countries receiving foreign aid. The Bond would work in the following way: the Government would sponsor the issue of an insurance policy to cover the risk of catastrophes in a specified country or region. The risk premium would be paid by the protected countries and the UK Government would underwrite the bond issue. Countries protected by the bond would be selected from those currently receiving development aid from DfID.

The Bond would be managed by providers operating in the London Market who would structure the bond and market it to potential investors. In the event of a catastrophe, the capital held would be released to the relevant government for distribution in line with the usual practices for disaster relief (such as rebuilding communities to be more resilient for any future events). If the contract expires and no catastrophe has occurred, investors would receive their invested capital, plus any yields over the duration of the policy.

³⁴

http://www.swissre.com/media/news_releases/Underinsurance_in_property_is_a_global_and_growing_challenge_says_lates_t_Swiss_Re_isigmai_study.html

³⁵ London Markets Group 2016 "When disaster strikes: The role of the London Insurance Market in helping countries to rebuild after catastrophe"

<http://admin.londonmarketgroup.co.uk/wp-content/uploads/2016/07/LMG-FAB-launch-final.docx>



Financial Innovations and Sustainable Development

The development of FACBs need not be restricted to sovereign governments - any international charity or aid agency could underwrite their investment in development and aid in this way. In fact, using an FACB might change agency views on successful 'outcomes'. A successful outcome would need to be insured over the course of its lifetime. Does installing a water system in a village that is washed out by flood the following year count as a successful installation?

The advantages to this approach are that international aid is better spent as it will reduce the amount which Governments and international agencies spend on short term disaster relief, providing much greater predictability in funding, increasing the budget for longer term development and facilitating more effective and cost efficient disaster relief planning.

The development of FACBs should encourage greater self-sufficiency in developing countries as they will facilitate international commitments to support developing nations to become self-sufficient by allowing them to take over the premium payments as their economies develop and their local insurance markets grow.

Summary Section 4













Innovation in financial structures is problematic. Many parts need to move at once, i.e. supply, demand, regulation, and culture. Developing public policy within this space is, unfortunately something of a dark art, as all too often well intentioned policy can have unintended consequences.

Policy Performance Bonds might encourage policy stability and longer-term thinking and commitment. Unfortunately, precisely because Policy Performance Bonds hold politicians to their promises that may be why governments have not adopted them.



Financial Innovations and Sustainable Development

The Interaction between Financial Systems Innovation and Sustainable Financial Systems

	PPBs	Land Value Tax	Disaster Reinsurance & FACBs
Summary	Policy Performance Bonds could be highly effective tools for policy stability.	Land value tax will require proper costing of ecological and environmental services value of land.	An effective way to enhance resilience in developing economies and reduce the impact of catastrophes on the poor
Encourage long-term investment			
Reflect pricing signals and risk			
Encourage development and growth			
Increased resilience to shocks			



Conclusion

While our financial systems are not specifically designed to deliver sustainable development, they are tools that can be tuned to help deliver sustainable outcomes. Nevertheless, policy interventions in markets, such as regulation, legislation, and taxation, must be carefully considered before they are applied as they often have ‘unintended consequences’.

Financial systems have great inertia, due to investment in knowledge, legal structures, regulation, training, customs, and infrastructure. In part this is a cultural phenomenon, as the concept of banking as a personal service³⁶ still runs deep. The basic underlying principles of investment, lending, risk and return seem to endure. On a mundane level this means that, while the number of solidly reassuring³⁷ buildings on high streets around the world used as banks may decrease slowly over time, it may be decades before counter service is stopped. For example, paper cheques persist in the USA yet Germany stopped using cheques a few decades ago. Fintech transformations may occur at the margins or at interfaces with end customers, consider the huge number of fintech phone ‘apps’, but still take years to affect core financial services. The UK’s real time gross settlement system is still largely written in COBOL, an antiquated computer language.

At a macro level, international cooperation is core to system wide changes. Policy makers are averse to policy solutions which could disadvantage the financial services under their remit. When it comes to taxation and fiscal instruments, there is a marked reluctance by policy makers to put their money where their mouths are and match private sector risk-taking. In the case of policy performance bonds, while the concept is sound and the principles understood, there are still no examples of this being put into practice outside of inflation linked bonds.

As “inertia can develop a momentum of its own”,³⁸ several of the innovations above are more likely to be adopted if they can be initiated ‘bottom up’. Bottom up techniques include trying to begin with smaller numbers of players in smaller, innovative jurisdictions. Ideally, some of these innovations can be tested initially without significant regulatory, legislative, or taxation changes. For the most part, financial measurement can be largely bottom up, through regulatory support for Confidence Accounting and regulatory tolerance and standards for MDLs would help. Monetary system changes, such as digital fiat currencies are being carefully examined, while common tenders can probably be implemented with minor legislative and regulatory encouragement. Financial technology can be ‘bottom up’ or nationally based. However, financial structure changes involve getting the public sector and attendant legislators, regulators, and tax authorities to want to try and improve. This is a ‘big ask’, but that doesn’t make it any less an important aspiration.

³⁶ Ernst and Young 2010 *Understanding Customer Behaviour in Retail Banking The impact of the Credit Crisis Across Europe* [http://www.ey.com/Publication/vwLUAssets/Understanding_customer_behavior_in_retail_banking_-_February_2010/\\$FILE/EY_Understanding_customer_behavior_in_retail_banking_-_February_2010.pdf](http://www.ey.com/Publication/vwLUAssets/Understanding_customer_behavior_in_retail_banking_-_February_2010/$FILE/EY_Understanding_customer_behavior_in_retail_banking_-_February_2010.pdf)

³⁷ Aage Myhre 2012 Lithuanian bank architecture: Symbols of wealth, power, and crisis <http://www.15min.lt/en/article/culture-society/bank-architecture-528-198891>

³⁸ Attributed to Douglas Hurd by Lord Howe.

APPENDIX 1 - Sustainable Financial Systems & Delivery Of The Sustainable Development Goals

Key




Positive Impact



Neutral Impact



Negative Impact

	Encourage long-term investment	Reflect pricing signals and risk	Encourage development and growth	Increased resilience to shocks
1 NO POVERTY 				
2 NO HUNGER 				
3 GOOD HEALTH 				
4 QUALITY EDUCATION 				
5 GENDER EQUALITY 				
6 CLEAN WATER AND SANITATION 				
7 RENEWABLE ENERGY 				
8 GOOD JOBS AND ECONOMIC GROWTH 				



Financial Innovations and Sustainable Development

9 INNOVATION AND INFRASTRUCTURE 				
10 REDUCED INEQUALITIES 				
11 SUSTAINABLE CITIES AND COMMUNITIES 				
12 RESPONSIBLE CONSUMPTION 				
14 LIFE BELOW WATER 				
15 LIFE ON LAND 				
16 PEACE AND JUSTICE 				
17 PARTNERSHIPS FOR THE GOALS 				



APPENDIX 2 – Other Suggested Areas of Financial Services Innovation

A1 Measurement

Internal Growth Rates

Currently there are a number of different methodologies in use to evaluate the state of pension funds for reporting and management purposes. These include risk free rate, gilt (government bond) rates, and expected asset returns. These methodologies can lead to over or under estimates, bias and volatility.

Viewed from a systems perspective, the evaluation of the current state of a pension fund is a matter of considering the inputs (contributions and returns on investment) and the desired outputs (pensions). Internal Growth Rate (IGR) is the rate of return that must be achieved by a contribution to deliver the promised pension benefit when due. The IGR is the rate of investment return to the beneficiary; equivalently, in a book-reserve arrangement it is the cost of the contributed capital to the sponsor employer.

With contributions and pensions separated in time, it is rational to consider interim states. The valuations can inform observers as to the sufficiency of the arrangements in place, and interventions made if necessary or desirable. For sustainability and stability of the system, this amounts to no more than requiring that the present value of contributions must equal the present value of the promised pension³⁹. In terms of sustainable development, a reduced requirement to demonstrate short term gains would enhance fund managers' abilities to take a longer term perspective on investment, particularly with respect to carbon risk and infrastructure investment.

Interim Assessment: Useful approach to pensions measurement, but medium-term consideration for SDGs.

Discount Rates

The discounting of future benefits is one of the most problematic aspects of cost-benefit analysis. The discount rate determines how much value we attribute to the present over the future. One of the biggest problems in finance is that short-term feedback tends to be positive, encouraging bubbles, while long-term feedback tends to be negative, meaning we learn slowly. As the discount rate goes to zero we learn very slowly, perhaps explaining many white elephant public works projects. As the discount rate goes high we learn very quickly, but typically not very sustainably. Stewart Brand remarks that, "Discounting the future led to modest short-term individual gain and horrendous long-term public loss. The accounting was too isolated."⁴⁰ What's the point of building for the long-term when income a few years hence is worthless? This is particularly problematic when considering long term, high impact events such as climate change. Jeffrey Sachs summarises well why discount rates contribute to a "tyranny of the present over the future".

³⁹ C Keating, O Settergren & A Slater, Keep Your Lid On: A Financial Analyst's View Of The Cost And Valuation Of DB Pension Provision, Long Finance (2013) - http://www.longfinance.net/images/PDF/Keep_your_lid_on_feb2013.pdf

⁴⁰ BRAND, Stewart, *The Clock of the Long Now: Time and Responsibility*, Basic Books (1999), page 120.



“Two subtle issues are at work in this example [market price of fish]. The first is that the market price of a species will generally not reflect the species’ societal value as part of Earth’s biodiversity. Market prices do not reflect the value that society puts on avoiding the extinction of other species, only on the direct consumption value of those species (for food, aphrodisiacs, pets, hunting trophies, or ornaments). Second, the rate of interest diminishes the incentive for the resource owner to harvest the resource at a sustainable rate. If the value of the resource is likely to grow more slowly than the market rate of interest, the blaring market signal is to deplete the resource now and pocket the money! Since the market rate of interest depends ultimately on the saving decisions and preferences of the current generation alone, without any voice of the future generations, the market rate of interest can give the signal to deplete the resource at the expense of future generations. When the current generation is impatient, that is, it places a high value on current consumption relative to future consumption, the market interest rate will tend to be high and the market signal transmitted to each individual resource owner will be to deplete the resources under the owner’s control. In essence, there is a tyranny of the present over the future.

As expected from the theory, slower-growing animals and plants are especially endangered today. Consider as an example one major category: slow-growing megafish. Their slow growth makes them a “poor investment” even in managed fisheries, and their large size makes them an easy prey...”⁴¹

In social cost benefit analysis, a social discount function is used to convert flows of future cost and benefits into their present equivalents. If the net present value of the investment exceeds zero, the project is efficient. However, the value of the social discount rate is often critical in determining whether projects pass social cost benefit analysis, and because small changes in the discount rate have large impacts on long-term policy outcomes, policy makers can have difficulty in choosing the “right” number. To this end the use of ‘hyperbolic discounting’ rather than exponential discounting has gained traction as an alternative method which address the problem of intergenerational equity⁴² however, its use is still not widespread.

Interim Assessment: An area for vigorous discussion, but not an immediately clear direction for SDGs.

Sustainability Approximates

Indicators such as Gross Domestic Product, Gross National Income and Gross Value Added are statistics used to measure current conditions as well as to forecast financial or economic trends for nations or regions. However, these indicators were never designed to be comprehensive measures of prosperity and well-being.⁴³

Alternative measures such as Sustainable National Income, which can be defined as the maximum attainable national income without environmental degradation⁴⁴, or Gross

⁴¹ SACHS, Geoffrey, *Common Wealth: Economics For A Crowded Planet*, Penguin (Allen Lane) (2008), page 40.

⁴² C Hepburn 2006 Valuing the far-off future: Discounting and its alternatives <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/discount-rates-climate-change-policy.pdf>

⁴³ Beyond GDP http://ec.europa.eu/environment/beyond_gdp/background_en.html

⁴⁴ R. Hueting 2006 The SNI, an indicator for environmental sustainability <http://www.sni-hueting.info/EN/2006-08-17-SNI-General-Public.pdf>



National Happiness⁴⁵ have been suggested as supplementary indicators, but they have yet to achieve widespread acceptance.

There appears to be a divide in many areas as to whether these approaches should develop separately, e.g. their own auditing and accounting, or whether the objective should be to work harder on incorporating approximates directly into the financial system, i.e. removing them as externalities through stronger market pricing. If the latter, these are transitional approaches. If the former, then there are large areas of the financial system which people believe are immune to ESG issues.

Interim Assessment: An area for vigorous discussion, but not an immediately clear direction for SDGs.

⁴⁵ http://www.grossnationalhappiness.com/docs/GNH/PDFs/Sabina_Alshire_method.pdf



A2 Monetary System Innovation

Cryptocurrencies

Bitcoin was probably the first cryptocurrency in 2009, and remains the dominant cryptocurrency with a 'market capitalisation' (total number of coins in issue times their last traded value) an order of magnitude greater than the next largest, Ethereum. There are thousands of cryptocurrencies (see www.CoinMarketCap.com for Crypto-Currency Market Capitalizations). Cryptocurrencies have a number of common features. These include:

- decentralisation - they are not issued or controlled by a central bank;
- cryptography - this is used to secure both the transactions and to control the creation of new coins;
- dematerialisation - distribution, exchange and transfer occur as numbers trading over the internet.

Bitcoin mining is the process of adding transaction records to Bitcoin's public ledger of past transactions or blockchain, which confirms transactions to the rest of the network and ensures that an individual cannot spend the same coin twice. Bitcoin mining requires solving computationally intense mathematical problems. Each time a transaction takes place, the software underpinning the network reacts by changing a parameter that makes the mathematical problem more difficult to solve. This requires more computing power - a particular problem when it comes to conducting microtransactions⁴⁶. Estimates of energy consumption for Bitcoin mining (not other energy costs such as storage and transmission) are around 10GWh/year, possibly half the energy consumption of Ireland. Slavish adherence to this model means either only a few cryptocurrencies arise or other, less energy-intensive models will be more widespread. Other models include use of digital fiat currencies or token-based systems with some degree of central third party.

Interim Assessment: Digital fiat currencies likely to prevail unless some governments begin to accept cryptocurrencies for taxation.

Quantitative Easing, Helicoptering Money, and Universal Income

The purpose of quantitative easing is to stimulate a national economy by encouraging banks to make more loans. Before the financial crisis, central banks would stimulate a national economy by cutting interest rates, however with interest rates cut to almost zero another mechanism had to be found.

Central banks deliver quantitative easing by buying securities, such as sovereign bonds, from banks, with money that did not exist before. The new money swells the size of bank reserves in the economy and in theory encourages them to buy assets to replace the ones they have sold to the central bank. That in turn raises stock prices and lowers interest rates, which should boost investment and thus the economy.

While there is some evidence that quantitative easing has had a marginal impact on the US and UK economies, there is also evidence that long-term corporate bond yields have been

⁴⁶ <http://www.coindesk.com/coinbase-implements-zero-fee-microtransactions-off-the-block-chain/>



adversely affected, thus having a long term impact on long-term investment, e.g. pension schemes.⁴⁷

It may seem an odd combination, but quantitative easing is often contrasted with ‘helicoptering money’, i.e. economic stimulus via direct payments to individuals, first proposed by Milton Friedman in the 1960s. The notion is that people receiving money will spend some immediately, generating economic activity, but also save some in financial institutions, thus helping them recapitalise. In turn this leads to suggestions such as a ‘universal minimum income’ or ‘guaranteed minimum income’. There are potential advantages of a universal minimum income ranging from fairness, gender equality, inclusion, simplification of benefit and tax regimes, as well as more clarity in public debates. The downsides appear to be cost, aggravation of immigration issues, and fears about losing a work ethic. A referendum on introducing a guaranteed basic income failed substantially in Switzerland in June 2016. The principal objection appears to be the likely interference with the ‘work ethic’.

Interim Assessment: An area for vigorous discussion, but not an immediately clear direction for SDGs.

Narrow or ‘Utility’ Banking

The concept of Narrow Banking arose from a post-crash desire to protect the “real” or non-financial economy from financial instability. The model of narrow banking was first proposed in 1933 by a group of economists from the University of Chicago⁴⁸. In it, banks’ two main functions, savings and loans, are separated. Savings are zero risk and are secured on safe assets (almost always government bonds) and are not used for proprietary trading in wholesale financial markets. Lending, is left to firms financed by private investors who are take a conscious decision to make risk based returns.

The advantage of narrow banking is that the public sector is not left exposed to losses incurred from proprietary trading- banks would not need a public bailout to secure savers money, and that the public has full confidence in the fiat currency system and the ‘utility’ or narrow banks. The main disadvantage under this model is that banks will be unable to give loans against demand deposits G Singh Banking Crises Liquidity, and Credit Lines A macroeconomic Perspective Routledge 2012 p193 . This would particularly impact on small businesses. To this end under this model the cost of capital would increase and leverage would decrease. It would also remove the ability of banks to create liquidity, forcing private agencies to hold large monetary buffers.

Interim Assessment: An area for vigorous discussion, but not an immediately clear direction for SDGs.

Capital Controls

Capital controls are measures taken by governments, central banks or other regulatory bodies to limit the flow of foreign capital in and out of a domestic economy. The measures

⁴⁷ C Flood 2015. Financial Times. European quantitative easing is a threat to pensions.

<http://www.ft.com/cms/s/0/a296c8da-efe3-11e4-bb88-00144feab7de.html#axzz477TBU0Zs>

⁴⁸ R Phillips 1992 The Levy Institute Working Paper No. 76 *The ‘Chicago Plan’ and New Deal Banking Reform*
<http://www.levyinstitute.org/pubs/wp/76.pdf>



taken may include taxes, legislation, tariffs and volume restrictions. The triggers for these measures may include foreign exchange policy objectives or concerns about an overheating of the domestic economy in the form of high credit growth, rising inflation and output volatility.

The last decade and a half has seen a rise in the popularity of capital control amongst policy makers, a rejection of received economic thought on the value of the free movement of money. A paper produced by the ECB in 2012 concludes that countries with a high level of capital controls tend to have fixed exchange rate regimes, a non-inflation targeting monetary policy regime and shallow financial markets⁴⁹. This evidence is consistent with capital controls being used, at least in part, to compensate for the absence of autonomous macroeconomic and prudential policies and effective adjustment mechanisms for dealing with capital flows. It is difficult to see capital controls as an important tool for development, though they may be necessary in emergency situations.

Interim Assessment: A digital fiat currency might be a better way to achieve similar goals with more finesse and less disruption.

⁴⁹ M Fratzscher 2012 ECB working paper series no 1415 *Capital controls and foreign exchange policy*
<https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1415.pdf?e3c3bcc698d9c0d2b510d9aa1c36c45c>



A3 Financial Technology Innovation

Digital Wealth Management

Digital wealth management refers to the automation of the suite of services traditionally offered to individual investors, who wish to invest capital in equities, bonds or other financial products. DWM services can offer a simplified client experience, tailored digital content, lower fees and increased transparency. More importantly, low overheads and reduced fees mean that DWM firms can reach client segments that, due to poor margins, have traditionally been out of reach for wealth managers⁵⁰. Some DWM products have been classed as part of the shadow banking system.⁵¹

DWM systems are only as good as the algorithms supporting them. DWM systems with limited functionality, i.e. those that offer advice on investment strategy and rely on users to make decisions on the purchase or sale of assets, offer low systemic risks. Those which have a higher degree of sophistication, and which can automatically place bids or sell assets when trigger points are reached have the potential to undermine market stability (see Algorithmic and High Frequency Trading (HFT) below). However, the growth of more sophisticated algorithms allows the use of enhanced analytics and big data to reduce risk and increase returns.

DWM does not necessarily encourage active ownership however, DWM systems can select strategic investments that match the profile of a consumer and can offer services such as personalized investment recommendations, rebalancing, and financial planning. To this end specifically tailored SRI products do exist - for example www.ethex.org.uk and given the advantages of an SRI driven strategy⁵² they are likely to prove popular.

New techniques in statistical processing and artificial intelligence (deep learning, e.g. neural networks with many more layers than before), are helping in digital wealth management by providing better, more dynamic rebalancing of investment portfolios, but also better surveillance and anti-fraud capabilities.

Interim Assessment: A technology that may benefit people in future, though it contains an intrinsic paradox that there can be a coherent theory of investment that contains enough variety of opinion to generate a diversity of investment approaches.

Crowd-funding

Traditional project funding requires the involvement of a small number of investors who are willing to invest large amounts of money. Crowd-funding is a way of raising money for a project by using the internet to ask large numbers of people to invest small amounts of money. The first online crowdfunded project is thought to have occurred in 1997 when US fans of the prog-rock group Marillion raised \$60,000 to cover the costs of a US tour, that

⁵⁰ http://offers.evalueserve.com/robo-advisors-impact-on-wealth-management?utm_campaign=FS16-FinTech-Campaign&utm_source=ppc&gclid=CK3NwbC3kMwCFcZAGwod92EPZw

⁵¹ <http://www.economist.com/news/finance-and-economics/21578668-growth-wealth-management-products-reflects-deeper-financial-distortions>

⁵² <https://www.morganstanley.com/sustainableinvesting/pdf/sustainable-reality.pdf>



otherwise would not have taken place⁵³. There are three different types of crowd-funding: debt, donation and equity.

Debt crowd-funding is a version of peer-to-peer lending, though it is usually themed, for example investment in renewable energy, environmental projects or international development. Examples of sites offering this type of service include www.abundancegeneration.com, www.banktothefuture.com, www.buzzbnk.org and www.trillionfund.com

Donation/Reward crowd-funding tends to be associated with a specific cause or event and does not provide a financial return. Rewards can include tickets to an event, acknowledgement in a book or on an album sleeve cover, promotional items, or just the satisfaction of donating to a worthy cause. Sites offering this type of service include: www.crowdfunder.co.uk , www.gambitious.com , www.justgiving.com, www.peoplefund.it , www.pleasefund.us , www.spacehive.com and www.hubbub.net

Equity crowd-funding is similar to debt crowd-funding, but instead of interest money is exchanged for a small stake in the business. If the business it is successful the value of the shares increases, if not the value decreases or the money may be lost entirely. The equity crowd-funding market is still small (a report by Nesta⁵⁴ found that £193m was lent in 2013 through peer-to-peer business lending platforms, whereas £19.5m was invested through equity crowd-funding) however, it is growing. Site offering this service include www.angelsden.com, www.crowdbnk.com , www.crowdcube.com , www.ethex.org.uk , www.microgenius.org.uk, www.crowdmission.com, www.seedrs.com, and www.sharein.com

One of the most significant opportunities associated with crowd-funding is the ability of communities to raise funds for local infrastructure. Crowd-funding also introduces creative opportunities for governance – what to invest, where, who gets the returns – and democratic control of commonly held organisations.

Interim Assessment: So long as fractional reserve banking is the dominant form of banking then crowd-funding can only be a poor relation or front-runner to traditional banking.

Algorithmic and High Frequency Trading (HFT)

Algorithmic trading involves the use of computer programmes (algorithms) for trading large blocks of stock or commodities while minimising the impact on the market. This usually involves splitting trades into small blocks and placing them according to pre-defined criteria in order to avoid affecting the price of stock.

HFT is similar to Algorithmic trading but involves placing thousands of orders at very high speed, making tiny profits on each trade by capitalizing on price discrepancies for the same stock in different markets. The efficacy of HFT has meant that it has come to dominate certain market segments, such as foreign exchange trading. While their defenders argue

⁵³ <https://www.equities.com/news/crowd-rocking-the-fund-from-marillion-band-to-the-ukcrowd-fundingday>

⁵⁴ <http://www.nesta.org.uk/project/crowd-funding>



that algorithmic trading and HFT improve market liquidity⁵⁵ and pricing consistency⁵⁶ there is the potential for significant risk to financial systems.

The report by the (IOSCO)⁵⁷ Technical Committee on Regulatory Issues Raised by the Impact of Technological Changes on Market Integrity and Efficiency noted that strong inter-linkages between financial markets meant that algorithms operating across markets transmit shocks rapidly from one market to the next, thus amplifying systemic risk. The report highlighted the May 2010 “Flash Crash” (which saw a 5%-6% drop and rebound in major US equity indices within the span of a few minutes) as an example of this.

HFT can affect markets in four primary ways⁵⁸:

- intensification of volatility - algorithms are already a significant feature of markets and as they can react instantaneously to market conditions, in the face of market turbulence algorithms may greatly widen their bid-ask spreads or stop trading altogether, thus exacerbating volatility;
- domino effects - as there is a high degree of linkage between markets and asset classes in the global economy, a meltdown in one major market can cause a chain reaction - the sub-prime crisis being a prime example;
- uncertainty - HFT is a notable contributor to exaggerated market volatility, which add to investor uncertainty and affect consumer confidence;⁵⁹
- rogue algorithms - HFT means that a faulty algorithm can accrue very large losses in a very short time. Knight Capital was pushed close to bankruptcy in August 2012, when a faulty algorithm, that was buying high and selling low, racked up \$440 million of losses in 45-minutes before staff managed to pull the plug on it.

Regulators have recognised the risks that these issues pose to confidence in market integrity and have responded. In November 2015, the US Commodity Futures Trading Commission approved a set of proposals, known collectively as "Regulation Automated Trading" which impose risk controls, transparency measures and other safeguards. In Europe, the Markets in Financial Instruments Directive II (MiFID II) will impose closer regulation and monitoring of algorithmic trading⁶⁰, imposing new and detailed requirements on algorithmic traders (and the trading venues on which they operate).

Interim Assessment: A controversial area, but certainly not one that is likely to promote SDGs.

⁵⁵ Tim Worstall 2014 <http://www.forbes.com/sites/timworstall/2014/03/31/michael-lewis-is-entirely-wrong-about-high-frequency-trading-hitting-the-little-guy/#e31e8771c516>

⁵⁶ Gary D. Halbert 2014 How High-Frequency Trading Benefits Most Investors <http://www.valuewalk.com/2014/04/high-frequency-trading-benefits-investors>

⁵⁷ International Organization of Securities Commissions 2011 *Regulatory Issues Raised by the Impact of Technological Changes on Market Integrity and Efficiency* <http://www.iosco.org/library/pubdocs/pdf/IOSCOPD354.pdf>

⁵⁸ D. Sornette and S. von der Becke 2011 Crashes and High Frequency Trading An evaluation of risks posed by high-speed algorithmic trading https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289016/11-1226-dr7-crashes-and-high-frequency-trading.pdf

⁵⁹ J Danielsson and I Zer London School of Economics May 2012 *Systemic risk arising from computer based trading and connections to the empirical literature on systemic risk* <http://www.riskresearch.org/files/DanielssonZer2012.pdf>

⁶⁰ HM Treasury 2015 *Transposition of the Markets in Financial Instruments Directive II* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/418281/PU_1750_MiFID_II_26.03.15.pdf
⁶⁰ <http://www.economist.com/news/leaders/21593457-once-cause-financial-worlds-problems-securitisation-now-part-solution-its>

Pluses and minuses sourced from <https://openclipart.org/detail/194298/plus-minus>



A4 Financial Structure Innovation

Securitisation

Securitization is the process in which certain types of assets are pooled so that they can be repackaged into interest-bearing securities. The interest and principal payments from the assets are passed through to the purchasers of the securities. Businesses can use securitization to raise funds for investment. Financial institutions can use securitisation to transfer the credit risk of the assets they originate, from their balance sheets to those of other financial institutions.

In order to comply with internationally agreed standards (Basel III), banks must fund risk-weighted assets with at least a certain amount of capital, known as the 'minimum requirements' of capital⁶¹. To this end banks are under pressure to balance their capital/liquidity ratios, and one way of doing this is to stop extending credit. This restriction of credit affects all businesses, particularly SMEs. SMEs are unable to issue securities as cheaply as larger firms, if at all. An alternative way to obtain credit is by aggregating credit needs⁶² through securitisation - by bundling and repackaging loans in groups and selling them to outside investors, thus freeing banks to extend more credit to businesses.

Used recklessly, securitisation can be dangerous, for example fuelling the catastrophic boom in American subprime mortgages which led to the financial crisis of 2008, and the public bailout of the financial services sector. While securitisation is not risk free, post-crisis regulation has substantially reduced the risk to the financial system, and the byzantine excesses of Collateralised Debt Obligations would be difficult to reproduce - partly because the originating organisation now needs to retain some exposure to the underlying credit (the "skin in the game" rule).

The power of securitisation over the long-term can be seen in the over two-century-old Danish mortgage market. The Danish mortgage model has proved to be a very effective way of providing borrowers with flexible and transparent loans. In Denmark, specialist mortgage banks are the only financial institutions allowed to grant loans against mortgages by issuing covered mortgage bonds (Realkreditobligationer), which transfer market risk from the issuing mortgage bank to bond investors. Mortgage banks operational activities are limited to the origination and servicing of mortgage loans, their funding, exclusively through the issuance of mortgage bonds, and activities deemed accessory.

The transparency and integrity of the Danish Mortgage system, and its immunity to the financial crisis of 2008, have been much admired by policy makers around the world. The Absalon Project⁶³ (Absalon) was a financial services organisation supported by George Soros promoting the benefits of the Danish Model. It has worked with a number of countries, including Ireland, the UK, the Netherlands, Ghana, Nigeria, Kenya, South Africa, UAE Mexico and Malaysia, to explore how the Danish model could be more widely adopted.

⁶¹ M Farag, D Harland and D Nixon, Bank Of England 2013- *Bank Capital and Liquidity*
<http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2013/qb130302.pdf>

⁶² <http://www.economist.com/news/leaders/21593457-once-cause-financial-worlds-problems-securitisation-now-part-solution-its>

⁶³ <http://absalonproject.com/wp-content/uploads/2011/01/The-Danish-Mortgage-System-is-the-Best-Columbia-U.pdf>



Interim Assessment: Securitisation has a major role to play in achieving SDGs by increasing access to capital and accelerating the process of moving banking loans to longer-term investors; however there is no specific, direct recommendation for SDGs.

Investment & Client Categorisation – General, Green, and Social

Investment categorisation takes the forms of various ratings or audited compliance with standards. For example, a green bond is a debt security that is issued to raise capital specifically to support climate related or environmental projects⁶⁴. There is no universally agreed standard as to what constitutes a green bond, though there are substantial initiatives. Launched in April 2014 by CERES, the Green Bond Principles are voluntary process guidelines intended for use by the market. The Principles recommend transparency and disclosure in order to promote integrity in the development of the green bond market.

The Climate Bonds Standard attempts to help investors and intermediaries assess the environmental integrity of bonds. The Climate Bonds Standard consists of a certification process, pre-issuance requirements, post-issuance requirements and a suite of sector-specific eligibility & guidance documents. The Climate Bond Initiative set standards for bonds in four categories, “use of proceeds bond”, “use of proceeds revenue bond”, “project bond”, and “securitized bond”.

One charge frequently levelled at Green Bonds and Climate Bonds is that they are green ‘wrapping paper’ on standard financial instruments. Given that studies so far show that returns on green bonds are broadly similar to market returns, there is insufficient evidence that green projects are gaining access to cheaper capital. In other words, Green Bonds do not provide additionality as the green projects were economic and would have received funding anyway.

Categorisation of bonds is an old approach to restricting some investments and promoting others. A problematic area is the compulsory or regulatory imposition of rating standards, as opposed to voluntary adoption. For example, credit rating agencies began in the early 1800’s but surged after the Great Depression when certain investors, such as US public pension funds, could only invest in certain categories of rated bonds. A cautious assessment is that investment categorisation can help form markets but when imposed on markets they create regulatory arbitrage problems.

Client categorisation is an attempt to protect certain types of investors in order to stimulate markets. A good example is the Markets in Financial Instruments Directive (2004/39/EC) (MiFID). This European Directive aims to protect investors, foster competition in the financial services industry, and increase market transparency. MiFID introduces two main categories of client (Retail Clients and Professional Clients), and a separate and distinct category for a limited range of financial businesses (Eligible Counterparties). Retail Clients have the most protection. Professional Clients are companies meeting at least two out of the three following criteria: balance sheet exceeding €20,000,000, net turnover exceeding €40,000,000, and own capital exceeding €2,000,000. Professional Clients are considered to be able to assess their own risk and make their own investment decisions. Eligible Counterparties are investment firms, credit institutions, insurance companies, UCITS, and

⁶⁴ World Bank 2015 *What Are Green Bonds* http://treasury.worldbank.org/cmd/pdf/What_are_Green_Bonds.pdf



other regulated financial institutions and in certain cases, other undertakings. They are considered to be the most sophisticated capital market participants and have the lowest level of protection.

While on the fixed income side there is the Climate Bonds Initiative, on the equity side there has been a number of rating initiatives, e.g. Environmental, Social and Governance (ESG) reporting, Enhanced Analytics Initiative, SASB, GRI, or Environmentally Extended Input Output (EEIO) models. The idea is to complement existing analysis as a minimum, but sometimes to rate and shame. Academic evaluation of these approaches is, at best, mixed, with little concrete evidence across the literature that they are effective.

However, when expanded across markets it can lead to enormous complexity. Further, such approaches create moral hazard when the implicit indemnity, i.e. who pays for a violation by a bankrupt counter-party or who pays when there is a systemic collapse in information quality.

Interim Assessment: Client categorisation can help form markets when limited to basic consumer information, but these techniques are only transitional.

Consumption Taxes

A consumption tax taxes individuals or institutions when they spend money. Consumption taxes come in two main forms:

- Value-Added Tax which is collected from producers according to the value they add along the production chain;
- taxes on general consumption, or specific kinds of consumption, such as energy, alcohol or tobacco.

Across OECD countries approximately a third of revenues are raised through consumption taxes⁶⁵. The notable exception is the United States which does not have VAT (though states have a variety of sales taxes), and imposes considerably lower taxes on energy consumption.

While consumption taxes are well regarded by economists due to their positive impacts on saving and investment, simple consumption taxes can be regressive, particularly if applied to food, energy and clothing, as they hit poorest people hardest as they spend a larger proportion of their income on these goods and service.

Interim Assessment: Fundamental tax reform seems to indicate that land-value taxation is the likely single best reform, but consumption tax reform is, in turn, better than income tax.

Pigouean Taxes

Pigouean Taxes are named after economist Arthur C Pigou. They are taxes levied on any market activity that generates negative externalities (costs not internalized in the market price). Pigouean taxes are intended to correct an inefficient market outcome by being set equal to the social cost of the negative externalities. Real world examples of Pigouean Taxes include tobacco, landfill and carbon taxes, as well as the proposals for Financial Transaction Taxes (FTTs). FTTs are taxes imposed on specific transactions that are

⁶⁵ <http://www.oecd.org/ctp/tax-policy/revenue-statistics-19963726.htm>



designated as taxable. A good example is the so called “Tobin” Tax (named after economist James Tobin) which would be imposed on every amount exchanged from one currency into another. The purpose of the tax would be to discourage short-term currency speculation and reduce volatility.

The imposition of FTTs has gained traction amongst some policy makers following the financial crisis. 10 Member states of the EU (with the notable exceptions of the UK and Germany) are actively working to develop a tax on financial transactions.

In September 2011, the Commission published detailed proposals under which FTT would apply to all financial transactions, except the primary market and bank loans. Transactions on shares and bonds would be taxed at 0.1%, and derivative products at 0.01%. The FTT would have to be paid if at least one of the parties is based in the EU ⁶⁶. The UK opposes the imposition of an FTT unless it is applied globally, believing it would damage the competitiveness of Europe as an international financial market. The Tax Policy Centre⁶⁷ estimates that a well-designed FTT could raise up to about 0.4 percent of GDP (\$75 billion in 2017) in the United States.

Interim Assessment: FTTs need to be global in outlook and probably have little to do with SDGs.

⁶⁶ <http://www.bankingtech.com/276812/resurrected-financial-transaction-tax-poses-threat-to-eu-markets/>
⁶⁷ <http://www.taxpolicycenter.org/publications/financial-transactions-taxes>