Integrity and Security in the E-Century

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Abstract: E-commerce poses a myriad of regulatory issues. Understanding the technical, taxation and institutional issues posed by E-commerce that impact on the ability to provide such services aids in comprehending the vast integrity and security issues surrounding this innovation. The effect of this technological innovation is examined in the light of theories of regulation that postulate a struggle process between attempts to control innovation and further innovation and regulation. To understand how regulation of E-commerce may be counterproductive a case study of the evolution of regulation of derivatives is used to test a hypothesis concerning social and avoidance costs. A comparative case study of regulation of E-commerce is then examined to suggest a policy approach of a private sector solution within a public policy matrix similar to private deposit insurance.

Keywords: E-commerce, regulation, innovation.

Understanding the technical, taxation and institutional issues posed by E-commerce that impact on the ability to provide such services aids in comprehending the vast integrity and security issues surrounding this innovation.

Technical features¹ involve not just whether to use specialised and portable computer hardware but also issues of consumer protection (contractual and legal relationships between consumers, retailers, issuers and operators)², and issues of demand by consumers and supply (in terms of issuers and merchants accepting e-money as substitutes for cash)³. Value can be stored in different ways, recording methods must be specified and currency choices resolved.

Taxation issues involve not only jurisdictional, administrative, identity and encryption problems, but understanding how electronic commerce could be a means for tax base erosion, tax avoidance and tax evasion, while also providing a better means of tax collection. Institutional issues involve understanding the application of banking regulations, in terms of protective and prudential measures, concentrating on cross-border or international concerns and the necessary supervisory financial architecture. There are many unresolved policy issues⁴, such as who can issue e-money differs across countries, whether seigniorage effects of e-money and effects on monetary policy could lead to central banks only issuing e-money themselves or expend reserve requirements or take other action to encourage covering of risk. As well prudential supervisory issues⁵ of the risk of financial loss through fraud (manipulation or interception of electronic messages over computer networks) or accidental loss or issuer becomes insolvent, and operational risk preventing settlement eg expired cards, malfunctions, interoperability between products have not been solved through self regulatory measures, adequate information to consumers for risk assessment or deposit insurance.

Three types of criminal offences are made possible by the increasing use of e-processes or products: money laundering and illegal gambling⁶, tax evasion⁷, and counterfeiting, fraud or disruption⁸, as stored

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⁸ Two comprehensive documents which summarise the issues from both a national and international perspective are "Tax and the Internet, Discussion Report of the ATO Electronic Commerce Project: (August 1997) and "Second Report" (December, 1999) - both available at www.ato.gov.au - ATO Assist.
⁹ Refer to footnote 5.
value cards provide a less bulky and conspicuous means of transporting or transferring risks, although some measures such as tamper-resistant smart cards, cryptographic protocols on transactions record-keeping systems, expiration dates and value limits may alleviate problems of criminal vulnerability.

Using a systems approach9 helps define the problem in terms of operational, liquidity, credit, market and cross-border risks. For instance consumers using prepaid cards issued in one country while travelling in another, involves problems of different legal rights in place of issue and payment and regulatory arbitrage. Policy responses by supra-regulators – the CPSS, the Basel convenors and the G-1010 - are minimal to date. At the moment central banks are relying on existing laws but there is a concerted effort to develop supervisory cooperation to cope with the cross-border issues precipitated by electronic commerce such as settlement risk and security issues. For instance the Eurosystem, as part of its oversight role with regard to e-money schemes, is working towards establishing a harmonised approach in the areas of standard setting and assessment methodology relating to the technical security of the e-money schemes11 and most EU member countries are in the process of transposing two new Directives into their national banking laws12. This involves the role of home country supervisors and the host country to assess readiness, looking as cases of local management.

Apart from issues of consumer protection, criminal and prudential supervision issues, tax issues of jurisdiction, administration, identity, and encryption arising from electronic commerce (in particular internet banking and retail payments)13, of more immediate concern to governments, in terms of loss of revenue, is tax avoidance, although the use of electronic commerce by taxation authorities has had enormous benefits in certain OECD countries such as Australia.

Before proceeding to a comparative case study of derivatives and e-commerce to illustrate the difficulties of regulating innovations, this paper explores whether such innovations are a response to regulation, and hence will create further regulation which could be a self defeating process. This theoretical examination is made in order to formulate hypotheses so that the examination of case studies can be made within a clearly defined framework

I. E-Commerce as an example of theories of regulation and innovation

Various theories exist as to the evolution of innovative products or processes, such as the earliest financial instrument developed in the thirteenth century - bank deposits, and bills of exchange, which were developed to circumvent usury laws which meant that interest was charged in commissions or exchange rates. Bills were developed in France in the sixteenth century as disguised borrowings by offering a stream of income14. Equity evolved from the ventures of merchants - the Muscovy Company was chartered in 1553, the East India Company in 1600. The first permanent joint-stock company was the Dutch East India Company of 1602. In 1845 preference shares came to prominence in the railway mania in the United Kingdom, while in the USA the first issues of commercial paper occurred. Other major changes took place over a century later, with the first certificate of deposit in 1966, the first floating rate note in 1970, the first financial futures contract in 1972 and so on. However it was only in the 1980s that the curve of financial innovation took a steep jump (Walmsley, 1988, pp4-6).

Several theories of innovation allow us to put into perspective the nature, causes, risks and consequences of a very rapid growth in the diversity and the volume traded of financial instruments and the subsequent development of E-commerce. Table II summarises three theories which differ more in explanatory style than substance (based on Greenbaum and Higgins, 1985).

<table>
<thead>
<tr>
<th>Proponent</th>
<th>Content and Characteristics of the Theory</th>
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<tbody>
<tr>
<td>Silber (1975) &quot;The Linear Programming Approach&quot;</td>
<td>The theory basically says little more than that financial innovation is an adaptive response by the financial system to some external shock that expresses itself in terms of the system's cost of satisfying some constraint.</td>
</tr>
</tbody>
</table>

10 The Bank for International Settlements, “Clearing And Settlement Arrangements For Retail Payments In Selected Countries” (Committee On Payment And Settlement Systems Basel, September 2000).
11 In order to ensure that e-money schemes are safe and efficient and that issuers are sound, the Eurosystem has defined seven many minimum requirements for e-money schemes. Please see “Report on electronic money” ECB, August 1998 pp 23-27.
12 Both Directives should be implemented by member states by 27 April 2002 at the latest.
13 Refer footnote 7.
14 The first true government bond may have been the Grand Parti of France I in 1555 and was open to all lenders, not just bankers.
Deregulation followed enormous effects such as rising complexity and fragility with the system capable of collapse owing to the sheer weight of the system's elephantine structure. The financial system can be described as private participants vs the regulators with the latter attempting to restrain the financial system through some imposition of a constraint such as a price ceiling, a reserve requirement or an asset prescription. The system adapts in order to circumvent the regulatory initiative. The regulators respond by imposing yet another restriction, thereby prompting yet another adaptive initiative. The process continues ad infinitum resulting in an ever-expanding regulatory system together with an increasingly complex financial system - "the implication is that both represent a squandering of societal resources with a welter of perverse effects" (Greenbaum and Higgins, 1985).

Greenbaum and Higgins (1985) note that besides government and public regulation, investor learning and the development of costly and expensive delivery systems are sources of irreversible innovation. Similarly Walmsley (1988, p9) sees intensifying competition as a key stimulus since "a reputation for innovativeness is seen as a key competitive advantage in acquiring market share". The three theories of innovation overlook such factors. The mere existence of technology such as the personal computer and electronic providers of price information and satellites facilitated the globalisation and internationalisation of markets and have also stimulated innovation, although all the above additional factors may merely comprise Silver's constraints.

Another interesting fact of the theories is that they identify regulation as a stimulus to innovations designed to circumvent it. For instance, higher capital requirements for banks drove them out of traditional business areas. Possibly due to the time at which these theories were devised, the originators were unaware of the enormous effect that deregulation in the USA would have (e.g. abolition of fixed commissions in 1975 followed deregulation of the banking system which in turn was followed by the introduction of Rule 415 in 1982) and also in the UK, where major international banks have been allowed to buy stockbroking firms. Deregulation in New York further triggered a wave of deregulation elsewhere, notably Tokyo, Paris, Frankfurt and Zurich.

Classifying innovation by type can also assist in the analyses of the effects and risks of such growth in trading volumes as witnessed during the eighties and still occurring now. Table III (based on Walmsley, 1988, pp6-8) summarises types.

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<td>- described by Greenbaum and Higgins (1985) as virtually axiomatic and incapable of being empirically rejected.</td>
<td>The system is thus maximising some (linear) objective function subject to a set of constraints which can be regulatory in origin, technological or tax based. Each constraint has a shadow price - as it rises financial innovation occurs as resources are devoted to circumventing or overcoming it. The culmination of this effort is a change in the financial system in the form of a new claim, delivery system or organisation form.</td>
</tr>
<tr>
<td>Kane (1981)</td>
<td>The financial system can be described as private participants vs the regulators with the latter attempting to restrain the financial system through some imposition of a constraint such as a price ceiling, a reserve requirement or an asset prescription. The system adapts in order to circumvent the regulatory initiative. The regulators respond by imposing yet another restriction, thereby prompting yet another adaptive initiative. The process continues ad infinitum resulting in an ever-expanding regulatory system together with an increasingly complex financial system - &quot;the implication is that both represent a squandering of societal resources with a welter of perverse effects&quot; (Greenbaum and Higgins, 1985).</td>
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<tr>
<td>Greenbaum and Haywood (1971)</td>
<td>The growth of real income and cyclical increases in interest rates creates a demand for a wider variety of financial claims. After claims are brought into existence owing to high interest rates the firms producing the claims become candidates for regulatory protection. Because regulation is skewed towards protecting firms in the financial system, it tends to relegate innovation to the periphery and inhibits existing firms from leading the innovation process. New claims tend to spawn new firms and delivery systems. By pushing innovation to the system's periphery and then protecting financial firms, the public regulator may foster secular proliferation of claims growing out of interest rate cyclicality.</td>
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</table>

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**Table III - Types Of Innovation**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
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<tr>
<td><strong>Aggressive</strong></td>
<td>Introduction of a new process or product in response to a perceived demand, used to gain a market share by displaying an ability to innovate.</td>
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<tr>
<td><strong>Defensive</strong></td>
<td>Innovation in response to a changed environment or transaction costs, e.g. the reform of the London system 1983-1985 caused by the change in the brokerage rules.</td>
</tr>
<tr>
<td><strong>Risk Transfer</strong></td>
<td>Allow the transfer of the price or credit risks in financial positions such as interest rate and foreign exchange futures and options, currency and interest rate swaps as well as tradeable loans, securitisation and credit enhancement tools. These are among the most important of innovations. Their development was stimulated by the emergence of floating exchange rates in the mid 1970's and the adoption by the</td>
</tr>
</tbody>
</table>
Federal Reserve of its New Economic Policy.

(4) **Liquidity Enhancing** -
Improves the negotiability of financial instruments and includes note issuance facilities, securities sold with put options and the creation of secondary markets for trading securities.

(5) **Credit-generating** -
Broaden the supply of credit, either by mobilising dormant assets to back borrowings or by tapping previously untouched pockets of credit. An example of the former is securities backed by specific buildings. An example of the latter is the use of swaps to issue securities in markets which the issuer would not normally wish to tap directly, because it would have no use for the currency or kind of funding provided.

(6) **Equity-generating** -
Have been more limited than other types but include, for example, variable-rate preferred stock, which tapped an entire new market of investors, and equity contract notes.

Within each category innovations can be process types (such as a new payments mechanism) or product types. In E-commerce process innovations refers to access products that allow consumers to use electronic means of communication to access otherwise conventional payment services (for example, use of the internet to make a credit card payment or for general "online banking"). Product innovations in E-commerce are stored value or prepaid products in which a record of the funds or value available to the consumer is stored on a device in the consumer's possession, such as prepaid cards (sometimes called electronic purses) and prepaid software products that use computer networks such as the internet (sometimes called digital cash). Each type of innovation - whether derivatives or E-commerce - which fits into the above typology will have a different impact on systemic risk levels and on the individual financial institutions.

To understand the impact of innovations Sinkey (1992) proposed a new model which combines elements of the above three theories - "the regulatory dialectic model" which postulates that exclusionary rules imposed on financial institutions, particularly rules producing non contestable markets, promote innovation to circumvent such restrictions. E-commerce fits into this theory. It is both an aggressive response (tapping new markets such as business to business) and a defensive response to requirements to control the payments systems and monitor transactions (such as the reporting of transactions over a certain limit to a regulatory body), which can create both new processes (such as home banking) and new products (such as credit cards) which can be used to achieve the other four functions of innovations - transferring risk, enhancing liquidity, generating credit and equity (via digital prospectuses), and in particular by allowing e-trading in securities as well as in the provision of information on companies, securities, economies as well as on general consumer products and services.

The regulatory dialectic model on which this hypothesis is based is based on the philosopher Hegel's concept of the dialectical change (1770 -1831) consists of three stages: (1) thesis, (2) antithesis, and (3) synthesis (Sinkey, 1992, p. 153). In this process, the thesis and antithesis clash and through an ongoing struggle evolve into a synthesis. The synthesis then becomes a new thesis, and the process of change or struggle goes on and on. Cast in a regulatory framework, the regulatory dialectic pits the regulators against the regulatees in an ongoing struggle. The regulators attempt to impose constraints on the financial system (e.g., interest rate, product, or geographic controls). The regulatees, who tend to be driven by profit or wealth-maximisation motives, attempt to circumvent the restrictions because these are implicit taxes on their profits. If the circumvention is successful - which it usually is, because profit-motivated individuals tend to move faster and more efficiently than bureaucrats - then the regulators attempt to close the window or loophole and the struggle becomes an ongoing one.

One positive aspect of the struggle process is that it tends to spur financial innovation by regulated firms and to encourage less regulated firms to infringe on the more regulated ones. Thus, the regulatory dialectic also can be viewed as a theory of financial innovation, explaining how derivatives developed in response to regulatory rules or how in Australia in the seventies banks bought shares in non-bank financial institutions to circumvent regulations relating to the volume and type of lending. Similarly in the eighties it is claimed that capital adequacy rules brought in to control the growth of high risk lending resulted in a distortion in resource allocation, with banks lending more to the residential and less to the business sector.

The process of change in the financial system can be viewed as occurring autonomously or as being induced either by market forces (e.g., technology) or regulatory ones or both. To ignore any of these

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15 In Australia this body is called Austrac, the purpose of which is linked to monitoring all types of cash transactions with the purpose of reporting criminal or tax evasion activities to the relevant authorities.
components presents a less than complete picture of the process of change. To focus on the interaction of technological and regulatory forces in the developing fusion of competition, the concepts of structural arbitrage and economies of scope are useful. These help explain why regulatory change may be ineffective as firms may circumvent regulation, or regulators may not understand how economies in banking are best promoted.

An important component of the reregulation process is again the contestability theory of multimarket competition\(^{16}\), whereby markets are assessed in terms of barriers to entry. The financial system is characterised by a industry or marketplace that has both legislative and natural barriers to entry and exit. The natural sunk costs of entry and exit are those of technology, 'learning by doing', or 'know how' referred to above (Baumol, 1982, p. 299). The legislative barriers are created by governments who perceive the role of the financial sector to be uniquely intertwined with the goals of governments regarding the economy, which is "to safeguard the integrity and value of the currency - the maintain the stability of the banking and wider financial system and the integrity of payments systems: and to promote the efficiency and competitiveness of our financial markets" (Brady, 1988, p.49).

Two key legislative barriers to entry and exit are created by governments in order to promote structural efficiency and comprise,

- regulatory bodies to supervise with charters which list specified goals, such as maintaining the stability of the currency and/or controlling inflations to a set range;
- licences, which are required to carry on a business in the financial system for a range of financial institutions. The licence carries requirements to ensure the application of prudential and prudent measures in order to ensure uniformly prudent conduct of business for banks.

Exit conditions are governed by those licenses and regulatory bodies. Legislative barriers create sunk costs of not only entry but exit, which can also arise from both natural barriers such as the establishment cost of a financial institution in terms of technology, manpower and capital. Consider the position of any banking entrant seeking an orderly withdrawal from the markets. With restrictions on new entrants, ownership, mergers, and takeovers, these financial institutions are very unlikely to be able to recover sunk costs by selling out at a profit.

Regulatory interference slows the rate of adaptation by imposing entry restrictions and corresponding avoidance costs on particular firms. In a free society in which multiple legislatures and regulatory agencies compete for regulatees, tax receipts, and/or budgeted funds, authorities cannot induce either great or long-lasting divergences between the actual and the cost-minimising market structure. However this divergence may be justified if it produces greater stability. If regulatory goals in controlling the banking sector restrict entry and exit, then it is a non contestable market where the economic principles of perfect competition cannot be applied, and economies of scale and scope may best be achieved by a smaller number of larger banks, than by the opposite (Baumol,1982). Within such a market regulation can beget innovation both as a means of competition and as a means of reducing costs.

II. Hypotheses and Research Methodology

Innovations are, of course, not costless. They involve avoidance costs which are the incremental costs of creating an unregulated substitute product or institutional arrangement, such as derivatives provided by over the counter markets, or establishing a proprietary system to allow internet banking. There are also joint costs involved in providing innovative products in a traditional framework. However if the benefits of joint production or the economies of scope created by providing innovations together with traditional products, such as internet banking together with face to face teller withdrawals and transfers, exceeds the avoidance costs, avoidance activities are encouraged. If regulation encourages innovation to circumvent it then regulation produces avoidance costs.

Another cost of regulation in respect to innovation, is the social cost of a regulatory exclusion which is the sum of (1) the administrative costs of promulgating and enforcing the restriction and (2) the smaller of the forfeited economies of scope and avoidance costs. Regulatory changes may be aimed at improving the confidence and convenience functions of financial institutions, but may be defeated through the regulatory dialectic process which produces innovations, structural arbitrage (Kane, 1984), or moving an organisation across laws and regulatory bodies to lighten its tax and regulatory burdens, and the degree of contestability of the marketplace that the degree of barriers to entry and exit.

It is thus the purpose of this paper to test the following Hypothesis:

\(^{16}\) See Baumol, Panzar, and Willig (1983) and Kane (1984).
HI: That regulation of innovations in financial products and services can result in both avoidance and social costs.

The research methodology will be two case studies, one involving attempts to control the growth of derivatives and the other E-commerce, using new regulations evolved to control the payments systems in Australia as an example. Historic attempts to regulate derivatives is used as a type of control case study to illustrate what the likely future effects of similar attempts in relation to E-commerce. An additional reason is that use of derivative products in conjunction with E-commerce will provide an immense challenge to the international regulatory system.

Rather than attempting to quantify costs, the case studies will discuss them in a framework or how these innovations can raise systemic risk levels, disturbing or distorting systemic efficiency and in the worst event provoking a systemic crisis. The OECD (1991, pp14-18, 1992, pp86-87) has defined these terms in relation to systems theory, where a system is any set of interrelated parts which recognisably constitute a connected whole. Therefore any financial system is a system with components comprising trading and regulatory arrangements and market participants, and four layers starting with natural securities markets, then international securities markets, international financial markets and finally the world economy of which the latter or third systems layer is a part.

A systemic crisis is thus any disturbance which severely impairs the workings of the system and at the extreme causes a complete breakdown in it. Systemic risks are those risks which have the potential to cause such a crisis. O'Connor (1989) has narrowed the definition to those financial risks which arise from institutional and structural arrangements in markets which all participants must bear as a group.

The OECD's (1991, p14) real concern with the characteristics, modus operandum and volume of derivatives trading or any financial innovation, is its potential to generate systemic risks sufficient to endanger the stability of the bottom system's layer, the national markets. Such a disturbance or crisis can then be spread to other systems layers by the way innovative products and processes permit rapid transmission of shocks. The effects of such shocks on the real economy can have "real damage potential" if they

- disrupt the savings and investment processes;
- undermine the confidence of long term investors; and
- disrupt the normal cause of economic transactions due to a breakdown in the banking and payments systems as a consequence of the collapse of the securities markets (OECD, 1991, p15).

The extent of such damage would depend on the size and duration of the breakdown as well as on the readiness and ability of monetary and other appropriate authorities to take corrective action.

Overall, the OECD (1991) see settlement mechanisms as being risky to the system in their ability to transmit members' failure to other members and thence to the financial sector more widely. Risks arise from:

- the potential insolvency of members of these systems;
- incompatibility between different settlement systems, for instance, different timetables for collecting and paying out cash; and
- cross border difficulties arising from mixed legal and fiscal environments, the necessity to use a home country's currency and security, time and communication differences, foreign exchange risk, exchange controls and restrictions on information flaws.

Within this scheme of market and payments mechanism lies a vital system characteristic - systemic efficiency. This can be defined from a microeconomic production viewpoint, as the ability to provide at high speed a product or process at a price where marginal revenue equal marginal cost, as conditions of perfect completion are assumed to exist. Oligopolistic pricing could distort the process but so could the operation of the market for derivatives on a macro level, so that capital markets do not perform their role of allocation of scarce resources amongst competing ends in an efficient manner, because security prices do not fully reflect all available information (definition of efficiency taken from Fama, 1970, p4).

Whether a weak form of efficiency is used as a criteria - the information set impounded in security prices is only historical prices - or a semi strong form - the information set is all publicly available information - or a strong form - monopolistic access to information may exist but monopolists perform a function of rapid dissemination of information - it is of concern to all supervisory authorities as to whether derivatives or E-commerce can distort any of these forms of market efficiency.

BIS (1992, p197) using measures of volatility as the standard deviation of monthly stock market returns, and of bond yields to maturity concluded that in the USA, Japan, Germany, France, the United Kingdom and Canada that asset price and exchange rate volatility over the period 1982-1992 has increased - the exact period when deregulation and financial innovation has been at its peak.
The role of derivatives and e-commerce can best be analysed by considering how they may contribute to a systemic crisis which is defined as having four stages. Stage I begins with a sharp, sudden fall in the prices of securities and derivatives, that is, enhanced market risk. Stage II is the spreading of price falls from one market to another while Stage III is the effect of the preceding stages on international financial intermediaries, leading to the failure of one or more, which could endanger the system through the effects on the liquidity and solvency of interdependent participants, and hence can be analysed by consideration of effects on liquidity risk. Stage IV is the effect Stage III has in generating a crisis in the core banking and payments system, causing a currency run and/or collapse of financial institutions. Effects can be analysed at both an individual and systems level.

III. Case Studies

Table IV using the above analysis summarises possible threats posed by e-commerce and Derivatives.

<table>
<thead>
<tr>
<th>Role of Innovations in increasing the Risk Profiles Of Individual Financial Institutions and contributing to lowered systemic efficiency, raising systemic risk levels and precipitating a Systemic Crisis</th>
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<tbody>
<tr>
<td>1) <strong>Liquidity risk</strong> is the risk that it is either impossible or expensive to convert derivatives or e-money to cash - this may prevent instruments being traded or quoted, e.g. perpétuals during 1987-88, or cause liquidity problems to individuals or institutions relying on an access service dependent on e-commerce. <strong>Liquidity risk problems</strong> when full blown across a large volume traded instrument (e.g. index futures during October, 1987) or a stored value card or due to technological failure or fraud involving an access innovation in E-commerce. <strong>Payment problems</strong> - systems have been put under severe pressure by the dramatic increase in settlement volumes. For instance in 1985 the Chips and Fedwire systems in the USA processed regularly US$1 trillion in a day. One New York bank had a severe computer problem so the Federal Reserve was forced to record an overnight loan of US$22 billion. E-commerce in its process or access form is meant to alleviate many of these problems. Derivatives have distorted the definition of monetary aggregates and have posed problems to the implementation of monetary policy through interest rates. This factor cannot just distort the efficient operation of the financial system but can be a precondition to a systemic crisis. The BIS (2001) survey of e-commerce concludes that its use has little or no effect on monetary policy although many countries are still not including e-money in monetary aggregates. This can contribute to a crisis, as can 2) <strong>Market risk</strong> which arises for instruments such as futures or options that are widely and frequently traded. <strong>Market risk</strong> is the risk that changes in market interest rates or exchange rates will lead to a capital loss. This may be less of a risk with e-commerce, but can have effects if dramatic changes in exchange rates are not factored into settlement procedures relying on e-commerce. 3) <strong>Credit risk</strong> has to be widespread to constitute a systemic risk contributing to a crisis, but can play a large role if a major financial institution or exchange encounters problems. Securitised products can transmit shocks, as can faulty practices such as the absence of margining or low margining in relation to derivatives. Similarly, issuers of e-money and the providers of access services can fail constituting a similar risk, in terms of counterparty default. 4) <strong>Exchange rate fluctuations</strong> can be precipitated by the widespread use of derivatives, as the development of derivatives together with <strong>excess competition</strong> and too <strong>rapid diversification</strong> led to volume trading in derivatives to enhance profitability and the taking of large positions by major financial institutions (BIS, 1992, pp198-201). It has yet to be shown whether e-commerce plays any role in stabilising such fluctuations by virtue of ease of convertibility and providing rapid payment mechanism. <strong>Risk transfer</strong> products and processes which use both derivatives and e-commerce can set up interconnected exposure links which can then transmit risks right throughout the system.</td>
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The OECD and BIS recommended the adoption of regulatory solutions to the problems of derivatives which they believe will result in minimum avoidance and social costs. These are examined as they can shed light on the evolution of regulations in relation to e-commerce and whether this evolution will fulfil predictions of innovations theorists, in particular Sinkey (1992). In Table V, BIS or OECD solutions are listed next to each problem. However as will be discussed in the concluding section the problems and solutions may be far more fundamental and of macro coverage, than what are more micro, partial, temporary, solutions discussed in this section and may lead to an ever increasing cycle of further innovation and regulation.

TABLE V : A PROBLEM (Innovation) AND SOLUTION (Regulation) MATRIX FOR DERIVATIVES

<table>
<thead>
<tr>
<th>1.0 INNOVATIVE MARKET MECHANISMS</th>
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<tr>
<td>(a) <strong>Dealer vs Auction</strong> : Dealer markets, an innovation accompanying derivatives, needed more capital for greater risk concentrations. They also had problems of generating reliable information, processing transactions, providing liquidity and a degree of automation in price quotation and order routing. <strong>Solution:</strong> Apart from recommendations for all markets to automate settlement procedures, (claimed advantages are on line information re risk exposures, improved price quotation and order routing), other suggestions to improve systems capacity have focussed on measures to limit volumes of trade and volatility and enhance liquidity.</td>
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<tr>
<td>(b) <strong>OTC (over the counter) vs ETC (exchange traded)</strong> were another innovative market structure accompanying...</td>
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</table>
### Table V: A Problem (Innovation) and Solution (Regulation) Matrix for Derivatives

derivatives where the lack of disclosure in the former makes insider trading and other forms of market manipulation difficult to detect

**Solution:** New trading rules were needed to ensure uniformity between markets and that price volatility does not slow order placement, routing, matching, execution and information dissemination. Confining OTC transactions was not a political option and would face opposition on grounds of reduced competition and the fact that foreign exchange and money market transactions would still occur outside exchanges. OTC transactions could be better risk-managed by the imposition of trade and price reporting requirements on off-exchange deals.

#### 2. Programme Trading

The simultaneous purchase (or sale) of 15 or more stocks with a total value of AS1 million or more. Trading strategies facilitated by programme trading include index arbitrage, portfolio insurance, asset allocation and index substitution. The effect of index arbitrage is to push derivative and cash prices together in the same direction, except where no firm prices exist for component stocks. Then the two markets diverge, with derivatives transmitting pressure to cash markets under extreme stress. Instead of being a means to ensure market stability and liquidity, the OECD (1991, p22) perceived it as a means for transmitting volatility. Similarly portfolio insurance (buying or selling the derivative to protect against physical price movements) is seen by the OECD as a trading strategy which can prolong a bull run and precipitate a bear run in both cash and derivatives.

**Solution:** In the USA restraints of index arbitrage and programme trading were requested by the NYSE and SEC where the Dow Jones Industrial Average advances more than 50 points. The SEC has given a legislative mandate to regulate programme trading. Portfolio insurance has fallen into disuse - banning is not recommended by the OECD as they feel it will take an alternative form.

**Solution:** Circuit Breakers are the use by regulators of the power to interrupt, or restrict trading to allow emotions to cool, information to be disseminated and the balance of supply and demand to be assessed more accurately. They can be related to the volume of trading price movements and those left to market authorities. One perceived flaw is that freezing trading in one market causes demand to be met by sales in other markets, spreading a crisis.

**Solution:** Margin Requirements have two purposes: prudential and reduction of highly leveraged positions by speculators which might contribute to price volatility. The problem is that the question of what is the right level cannot be entirely settled by formula, as predictions bear risk themselves, other risk management safeguards may not exist, and it is costly to cover every eventuality - there is room for an element of judgement.

### 2. Settlement and Payments Issues

#### Individual Systems Risks

These comprise capital risk, a counterparty failing during the process of exchanging securities for money and market risk, or the deal having to be replaced at a different price because one or other counterparty fails before the exchange of securities for money takes place. These risks can remain with the original counterparties to a deal, or be transferred in whole or in part to third parties, who provide the payment and settlement services.

**Solution:** Most systems attempt to achieve transfer of delivery and payment simultaneously, irrevocably and unconditionally by three methods - intra-day finality, end-of-day finality and deferred finality. Methods used often achieve only good enough delivery for value and payment (DVP). If DVP cannot be achieved, other methods are used to reduce, redistribute or protect against capital risk, such as monitoring of system membership, shortening settlement periods, netting arrangements, use of a central counterparty, a collateralised system, margin pledging, loss sharing arrangements, external support.

### 3. General Supervisory Problems

#### 3.1 Capacity of Central Banks to regulate

Channon (1988, p367) saw derivatives growth placing central banks in the position where lack of knowledge and lack of risk measurement techniques meant they were unable to control exposure position of banks, and had no ability to control the rest of the market place as it lay outside their arena - "Few central banks had supervisory departments able to understand, much less monitor these products and their effects on banks risk profiles".

**Solution:** Part of this quandary has been solved by new capital adequacy rules based on counterparty risk and will be assisted further by the extension of such rules to cover market and interest rate risk (BIS, 1992, p210). In order to reduce the scope for regulatory arbitrage between banks and non banks the Basle Committee on Banking, Supervision and the Technical Committee of the International Organisation of Securities Commission are working towards consistent rules to be applied to institutions on a consolidated basis and consistently between nations.

#### 3.2 The effect of derivatives on monetary policy

Channon (1988, p371) saw the interaction between derivatives and governmental attempts to apply monetary policy steadily towards price stability as adverse in the following respects:

- i. the effect new instruments have on increasing the demand for money through their effect on monetary velocity.
- ii. the effect new instruments have on blurring the distinction between traditional monetary instruments and non monetary ones, between broad and narrow aggregates so that definitions of M1 and M2 have become less meaningful (Walmsley, 1988, p12).

**Solution:** Due to this phenomenon, a growing number of increasingly complex systems of economic aggregates have replaced traditional measures as a basis for national financial policy, but only as guidelines, as traditional relationships no longer hold (Channon, 1988, p371).

- iii. the growth of derivatives has resulted in a higher proportion of money that earn interest, which reduces the
TABLE V: A PROBLEM (Innovation) AND SOLUTION (Regulation) MATRIX FOR DERIVATIVES

| Sensitivity of demand for money to changes in rates. Changes in rate levels are not reflected in interest rate differentials and an impact on monetary aggregates (Walmsley, 1988, p.12). |
| iv. Securitised credit and the increased alternatives open to borrowers means that policy options become fewer and fewer. Direct controls on lenders have been jettisoned in favour of internationally accepted supervisory practices, in order to avoid dramatic effects on exchange and interest rates and capital flows. |
| Solution: Since derivatives affect monetary policy, which if used incorrectly is one of the causes of crisis, a solution is needed which does not involve heavy handed vetting of new products, but relies on a co-ordinated use of indirect checks such as capital adequacy applying across all market players. |

3.3 Opaqueness of derivatives markets or disclosure problems

BIS (1992, p.208) sees derivatives as leading to greater opaqueness of instruments, and relationships between instruments and markets, with regard to risks, exposure of counterparties and of market concentration.

Solution: Internationally harmonised accounting disclosure in this area.

From the above analysis two observations can be made:

- That the threats posed by derivatives and e-commerce are similar in nature, except that the former’s role has been evident in several systemic crises, (October, 1987, 1989, 1998) while the latter has yet to emerge.
- That the growth of derivatives has produced attempts to control derivatives which can be counterproductive – for instance capital adequacy rules produced further innovations – such as hedge funds resulting in a situation such as the Long Term Credit Bank disaster, and did not take account of other risks such as market and operational risk.

That is, regulation produced not only social costs in terms of the regulatory costs, but due to the fact that avoidance costs of hedge funds were less than the benefits conferred in the short term, severe systemic problems resulted.

The next case study will seek to whether the hypothesis holds in relation to the regulation of e-commerce, concentrating first on tracing the development of product and process innovations in Australia and its policy responses, comparing its regulatory initiatives to those in other OECD countries.

IV. E-Commerce and Regulations

In Australia developments have focussed around developments of card-based products, network/software-based products and electronic bill presentment, payment instruments and clearing and settlement systems. Developments in these three areas and a policy response directed at these innovations are summarised below.

A. Card-based products

As at November, 2001, usage of card-based e-money has yet to go beyond limited trials in Australia. Nevertheless, Australia is developing a smartcard industry, especially in electronic ticketing, which is internationally focused.

By 2001 projects were in process to supply communities using State governments as issuers with smartcards that provide a range of electronic services such as transport ticketing, library, parking, identification and electronic purse, with multiple-application smartcards due to be issued by early 2002, including Ecard, issued to tertiary students for identification, access to restricted areas, and electronic purse facilities for canteens, payphones, bookshops and library photocopying or used at retail outlets.

Two major banks, Westpac and ANZ Bank, have announced that they intend to upgrade their EFTPOS/retail terminals to support smartcard technology, while Telstra, Australia’s largest telecommunications company started issuing disposable smart phonecards in August 1997 on the Chipper card system. The company has also conducted several trials of multifunction reloadable cards. Trials of Transcard, a multi-application contactless smartcard, are still limited to certain city areas only. The technology is owned by a non bank financial institution, with cards available from certain newsagents or the St George Bank. The cards are reloadable up to A$500 and also have a loyalty programme.

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18 A study by the National Office for the Information Economy and Asia-Pacific Smartcard Forum found that in 1999 Australia’s smartcard industry generated AUD 450 million, of which AUD 390 million was in exports (BIS, op. cit).
19 For instance ACTSMART in the Australian Capital Territory, a joint venture between two public companies, OneLink Transit systems in Melbourne.
20 This is a result of an alliance between a smartcard developer, a bank and a telecommunications company. Antoehr project involves a sports group, a bank and Visa International
21 An alliance between a smartcard developer and a hospital insurance group.
The Australian Mondex franchise, owned by the four major Australian banks, has not initiated any new developments in the last 12 months. Three of the banks are conducting in-house trials, of which two have been expanded to incorporate about 30 external merchants. However, the cards are still only issued to staff of the banks.

**Policy responses**

*Prudential supervision:* In June 2000, changes were made under the Banking Act 1959 to bring all holders of stored value (ie entities backing stored value) in relation to purchased payment facilities, such as smartcards and electronic cash, under the regulation of either the Reserve Bank of Australia (RBA) or the Australian Prudential Regulation Authority (APRA). The change brings holders of stored value under APRA's supervision where the holder of stored value is deemed to be carrying out banking business. This is considered to be the case where the facility is available for purchase and use on a wide basis, and where all or part of the facility's unused value is repayable on demand in Australian currency. Stored value schemes outside this scope remain the regulatory responsibility of the RBA under the Payment Systems (Regulation) Act 1998. Most other policy issues arising from the development of e-money are being dealt with by existing regulation.

Issues of competition are monitored by the Australian Competition and Consumer Commission (ACCC). Consumer protection is handled under the consumer protection legislation overseen by the Australian Securities and Investments Commission (ASIC). ASIC released a revised Electronic Funds Transfer (EFT) Code of Conduct (a voluntary code) in April 2001. The code now includes rules for consumer stored value facilities and stored value transactions. The provisions of the revised EFT Code will generally bind institutions that subscribe to it from 1 April 2002.

Issues relating to law enforcement, and money laundering in particular, are being addressed by the existing agencies, including the Australian Transaction Reports and Analysis Centre (AUSTRAC). Other policy responses include changes to the criminal code ("Measures to Combat Serious and Organised Crime Act 2001") by including e-commerce in the ambit of coverage and the formation of the Australian Prudential Regulation Authority (APRA) (Regulation) Act 2001.

### B. Network/software-based products

Technocash, a stored value payment mechanism that allows a consumer to make purchases over the internet or over an Australia Post outlet began operations on 1 September 2000. Customers purchase an amount (varying between A$20 and A$1,000) of Technocash along with a unique 16 digit alphanumeric code. The code, along with the expiry details, are then required to access the Technocash for an online purchase. A password can also be applied to the Technocash as an additional security feature. Technocash is non-refundable, but is transferable to other persons and can be combined and split; it has a valid lifespan of three years. Currently, there are 28 merchants that accept Technocash.

E-Cash, St George Bank's digital cash product, continues to be used on a small scale. It is now possible for customers of other banks to purchase E-Cash via the BPAY scheme. BPAY is a bank-owned third-party bill payment service. It allows customers of participating financial institutions to arrange for the transfer of funds from their bank account using phone or internet banking services.

**Policy response: Oversight issues:** Most central banks, including Australia, performing an oversight function of the payment system also monitor and analyse developments with regard to e-money. This includes collection of data and periodic meetings with the issuers. In other instances a wider range of activities are undertaken to study the organisational, legal, administrative, technical and security features of the product and the operator. Australia appears to rely on encryption, tamper-resistant chips and limits to stored value and does not adopt a practice of assessing whether a robust security system is in place to prevent counterfeiting and fraud.

### C. Electronic bill presentment and payment instruments, electronic clearing and settlement systems

EBPP (electronic bill presentment and payment) is the latest innovation in Australia and might become the most influential development in the retail payment market. EBPP integrates electronically the presentment and payment of bills. Therefore, EBPP is not a new payment instrument, rather a new concept that integrates different payment instruments and facilitates billing and paying. By far the most important feature of EBPP is that, depending on the model chosen, it has the ability to connect

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23 Central banks in Belgium, Finland, France, Germany, Italy, Lithuania, the Netherlands, Singapore, Spain, Sweden and Thailand include e-money schemes in the exercise of their oversight functions.
24 The Bank for International Settlements, "Clearing And Settlement Arrangements For Retail Payments In Selected Countries" (Committee On Payment And Settlement Systems Basel, September 2000).
authorisation, clearing and settlement processes electronically. However, the potential of EBPP does not only lie in the payment process itself but in the integration of billing and payment and connection to other information systems such as business-related software packages (eg delivery and accounting packages).

In principle, EBPP systems allow any electronic payment application to be included in the EBPP application. They are especially convenient as a replacement for paper-based giro payments or cheque payments by electronic credit transfers. Instead of using an existing data media exchange facility, recurring credit transfers can also be initiated via EBPP. On the debit payment instrument side, EBPP can also be used for direct debit transactions. Furthermore, other instruments, such as electronic money as well as credit card applications, may be included in the EBPP application. A further potential instrument of an EBPP system might be a real-time online credit transfer instrument, so to speak a substitute for a debit card on the internet.

The consolidator is the operator of the EBPP network. Its main function consists of the processing of transaction data during the transaction process. However, an EBPP system may take over more functions than just information processing, for example an extended account management tool for private and business applications or extended interoperability between the different systems. Additionally, the EBPP system may offer clearing and settlement services. Some or all participants are connected to the EBPP network via the consolidator.

Users fall into two categories - billers (or payees) and payers (or customers) - with substantial overlap. Billers include all kinds of commercial companies and public entities, while payers include consumers as well as commercial companies and public entities. Banks participate primarily as account providers, but also as users.

Based on the existing EBPP systems two generic models can be defined: the direct or non-consolidation model and the consolidation model. The latter can be categorised in two ways, firstly according to how the customer accesses the bill, and secondly according to the clearing and settlement functions of the consolidator.

In the direct model a biller provides its customers with its own electronic billing and payment application, offering them a single access site for viewing billing information and effecting bill payments electronically. Depending on the payment instrument used, the bill payment information is forwarded via the biller or directly to the biller’s or payer’s financial institution or credit card company for execution.

The consolidation models are further differentiated by whether or not a direct link between biller and customer exists. In a customer consolidation model the electronic bill is delivered directly to the customer. The biller maintains control of bill details until delivery to the customer. Then customers are able to control and store the bills and to integrate this work into their offline programs and processes. Customers initiate the payment through their consolidator.

In contrast, the service provider consolidation models establish no direct link between biller and customer. The consolidator collects bills from several billers and provides them to the payers. The customer has a single access site for viewing billing information and effecting bill payments electronically, whereas the biller forwards its billing information to one or more service providers that accumulate electronic bills from a variety of billers. Two variations of the service provider consolidation model exist: the thick consolidation model and the thin consolidation model. In the authorisation by a special agency on the basis of security measures such as limits. Therefore, authorisation is reduced to checking whether or not the customer has enough funds available. The EBPP system takes care of the other steps described above (authenticity, etc). However, if insufficient funds are available, the bank rejects the payment and the customer will receive a notification.

A real-time online credit transfer instrument might also be created for EBPP systems. Authorisation for these online transactions should be given immediately. Therefore, financial institutions must be able to confirm or reject the initiation of the payment in real time. This is equivalent to the authorisation or refusal of the payment, and procedures similar to the existing ones could be used for these transfers. Authorisation by the consolidator on the basis of daily and monthly limits and regular fund checks could be a way to circumvent time-consuming online authorisation processes. However, the rapid development of communications technology may make this approach unnecessary.

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25 It is also possible to have a separated application for payment and electronic bill presentment, the simplest for the latter being standard electronic mail. If no linkages exist between these applications, the customer has to transfer the information needed to the payment application.

26 One provider in the United States takes paper bills (sent to the provider rather than the customer by agreement) and turns them into an electronic format. Customers pay over the internet and the provider writes a cheque to the biller.
Clearing and settlement may be executed by conventional means as well as by new arrangements known as the Bank Internet Payment System ("BIPS"). This utilises either of the two consolidation models. In the service provider consolidation model all payment processes can be connected electronically. Through customer initiation the consolidator may be permitted to hand in payment instructions directly to the ACH (Australian Clearing House), which in turn forwards payment instructions to the payment system and related information to the financial institutions. The customer consolidation model also allows for electronic straight-through processing. The consolidator executes payments in cooperation with the customers' financial institutions or an ACH. However, the details of the clearing and settlement arrangements may widely vary depending on the model. The mentioned traditional payment instruments are used as well.

Furthermore, EBPP may also allow for new ways of clearing. In a centralised open consolidation model around the world work is being undertaken on EBPP systems. Cost reduction endeavours have spurred the innovation of EBPP. Most existing systems are going through their pilot phase or have started up recently. Whether eventually a single model will evolve or whether different models will coexist is not yet clear. Furthermore, the design of an EBPP system is by its very nature open to innovations. Therefore, new models may evolve over time. Although EBPP does not offer a new payment instrument its success may heavily influence the retail payment market. All in all, EBPP systems have the potential to crucially increase the efficiency of the retail payment system and its related business processes.

Policy response: Australian policy initiatives have concentrated on e-commerce products not the processes. For instance in the area of monetary policy and seigniorage, Australia together with a number of central banks including those of Austria, Belgium, Finland, Germany, Hong Kong, Italy, Lithuania, the Netherlands, Singapore, Spain, Sweden and the United Kingdom are collecting data on the e-money issued by banks. So far no central bank has indicated an adverse impact on the size of its balance sheet due to a possible decline in the value of the banknotes in circulation as a consequence of widespread adoption of e-money. The European Central Bank (ECB) is of the view that the central banks can maintain the size of their balance sheet if necessary by imposing minimum reserves on e-money issuers or by issuing e-money themselves. Given the low average value of e-money transactions and the relatively small cap on the amounts that can be stored on stored value cards, the value of e-money float is still very low. Losses on account of decline in seigniorage revenues are also perceived to be negligible by the central banks and have so far evoked no specific policy responses from them.

General legal issues. Within the Eurosystem, a comprehensive and harmonised regulatory framework for the issuance of e-money by traditional credit institutions and a new class of credit institutions called electronic money institutions (ELMIs) is provided by two EU Directives: the European Parliament and Council Directive 2000/46/EC on the taking-up, pursuit of and prudential supervision of the business of electronic money institutions and the European Parliament and Council Directive 2000/28/EC amending Directive 2000/12/EC relating to the taking-up and pursuit of the business of credit institutions. Most EU central banks accordingly envisage making suitable changes to existing legislation or new statutes in line with the two EU Directives. Elsewhere, for example in France, Hong Kong, Korea and Malaysia, it is felt that the existing legal framework is adequate to deal with issues related to e-money. In some countries specific legislation is being contemplated for regulating the issuance of e-money.

By comparison Australia is following an approach of using existing legislation and self regulation, despite the fact that electronic payments and clearing has the most potential for tax evasion, money laundering and counterfeiting.

Law enforcement issues. Many of the security features of e-money schemes, including the limits on value that can be stored on the cards, make them less attractive for the purposes of money laundering and other criminal abuses. Laws combating money laundering are applicable to e-money schemes, as they are to credit institutions, which in many countries are the sole issuers of e-money. As part of the oversight function emphasis is laid on studying the features of the e-money schemes to ensure that they do not broaden the scope for possible criminal abuse. For instance, the Bundesbank cooperates with the Federal Office for Security in Information Technology to draw on the latter's expertise to assess the potential risk.

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28 In Australia, there is currently one EBPP scheme operating. E-Bill, partly owned by Hermes Prisia (a large paper bill issuer in Australia) launched a service provider consolidator project in April 2000. Australia Post (a large agent for bill payment) and BPAY (a bank-owned bill payment system) are currently working on extending their services to EBPP.
29 For example in Korea, Thailand and Venezuela.
of counterfeiting in e-money. Some measures insisted upon by central banks which have been empowered under new banking legislation are the maintenance of an audit trail, ascertaining the identity of the customer and restricting the issue of cards to account holders at the relevant credit institutions. In some countries the supervisory role is executed by other bodies. In still other countries such as Korea, Mexico and Switzerland, specific regulations on the issuance of e-money have not been issued.

However as mentioned abuse of electronic processes of bill presentation, payment and clearing is still wide open to abuse, as most supervision relates to e-money only, and no account has been taken of cross border issues in Australia despite current initiatives in Europe.

Other issues. Some central banks are urging the market participants in their respective countries to adopt common standards on a nation wide basis to achieve the goal of standardisation and building up a common technical infrastructure such as card readers and terminals, in order to increase availability and reduce operational costs. Consumer protection issues are being addressed by some central banks (eg in Spain). In other countries the issue is addressed by an appropriate institutional authority different from the central bank. The emphasis in both cases remains the protection of consumer interest.

From this overview it is obvious that e-commerce in Australia is an extremely new innovation that appears as yet not to have produced enough burdensome regulation with onerous social costs sufficient to beget further innovations to overcome controls. However as a new product and process, another conclusion could be that avoidance costs are still too high to overwhelm the social costs or that both costs are preventing development and use of the product, which in Australia has been minimal. To date e-commerce, except in the floating of companies purporting to offer huge profits through e-commerce products, does not appear to have engendered systemic crises, raised risk levels or led to a deterioration in systemic efficiency.

V. Conclusion

Greenbaum and Higgins (1985, p124) saw regulation as a contributor to the innovation process and hence further regulation. This eventually produces a financial and regulatory system of ever increasing complexity and fragility, which could culminate in collapse due to the sheer weight of the system's elephantine structure. Unfortunately this collapse and crisis prompts basic reform, sewing further seeds for the innovation vs regulation cycle. Innovations made in response to volatility leads to a contraction of players unless volatility continues. To resolve such conflicting viewpoints as to what causes crises - regulation or innovation - we examined a case study of the impact of derivatives and the growth of regulation to control such financial products, and then explored the evolution of regulation of e-commerce in Australia. An attempt has been made to assess the overall costs in view of theories of innovation and regulation which view regulation as self defeating.

The OECD sees one aspect being of overriding importance in any solution to the debate as to the desirability of controlling innovation, which although it applied to derivatives is just as relevant in relation to e-commerce:

"The co-ordination of regulation among the markets that trade these tightly linked instruments is important, to assess properly and contain the risks associated with various trading strategies. The absence of co-ordination among markets that are separately regulated, but effectively unified through market activity, can increase confusion in abnormal conditions. Co-ordinated regulation may reduce the probability of major market disruption." (OECD, 1991, p23)

Diversity of national regulatory coverage can contribute substantially to systemic risk and crises, given one of four conditions, where,

- inadequacy standards in some countries led to a competition in laxity to attract business; or
- significant risk taking activities by major intermediaries were left unsupervised; or
- diffusion of responsibility for the supervision of conglomerates either among functional supervisors and/or among different national supervisors failed to deliver sufficiently comprehensive oversight of the risk exposure of such conglomerates; or
- differences in the status, coverage and objectives of the national supervisory authorities impeded international co-operation among them." (OECD, 1991, p38)

30 In EU countries, the USA, Hong Kong, Thailand, India, Lithuania, Nigeria and Singapore guidelines have been framed or vested in the central bank through legislation for the issue of e-money by banks.

31 Australia (Australian Prudential Regulation Authority), Austria (the Federal Minister of Finance), Finland (Financial Supervision Authority), Sweden (Swedish Financial Supervisory Authority, Finansinspektionen) and the United Kingdom (Financial Services Authority).

32 "PACE" and "Ducato"
In view of the undeniable adverse role derivatives can play in systemic instability and crises, and the potential for e-commerce to destabilise the system, the best most immediate solution may be internal risk management. At the moment a solution of system checks on internal management is being put on trial by both public and private bodies. For instance, in Germany the central bank has developed a questionnaire which is used as a checklist to analyse the security of e-money products. A similar approach is followed in Singapore, where the monetary authority assesses whether the issuing bank has put in place a robust security system to prevent counterfeiting and fraud. In France the central bank uses a tool called "protection profile" to assess the security profile of the scheme. In other countries, such as Austria, the assessment of security features is entrusted to a relevant technical organisation, while in Mexico a special task force has been constituted. In Hong Kong the central bank intends to engage outside experts to assess the security features as necessary.

Good internal risk management may best be encouraged by requiring that all issuers of e-money and providers of access services insure with an institution that is specifically established to underwrite the security and adequacy of controls. An insurance premium would be paid to this institution(s), which would come under the prudential supervision of a central regulator. Any issuer or provider not insuring would be required to carry a far higher level of capital adequacy. Disclosure of the lack of insurance would be made public to consumers. Such a private public sector partnership approach to regulation could encourage rather than inhibit the growth of innovations so that they are aggressive rather than defensive responses.

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