

# **How does the Financial System Work: Insights from Modern Finance and Economic Analysis**

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## *Overview*

The objective of these notes is to give the reader an introductory guide to the trends and findings of recent academic research into how financial markets and systems work. The literature is enormous and exploding following the global financial crisis (and these notes are far from complete or comprehensive). If there is a simple message it is that because financial contracts involve obligations and entitlements at future dates, they are fundamentally characterised by imperfect (and particularly asymmetric) information. This leads to market characteristics, outcomes and interactions between markets which depart markedly from the models of textbook economics on which many policy prescriptions, and attitudes towards the general optimality of free markets are based. It is worth noting that many of the findings are from models in which governments play no role. There is also a wealth of research (not considered here) examining the consequences of government involvement for financial market outcomes, which may provide alternative, or complementary explanations, for financial fragility and instability. The main point, however, is that just as it is inappropriate to assume that government regulation will work perfectly it is also inappropriate to assume that unfettered financial markets will work perfectly. Unfortunately, there is no set of simple, comprehensive, policy conclusions which emerge from the extant literature. In particular, regulatory interventions to avoid financial crises or other perceived shortcomings of unfettered financial markets can create other problems requiring further regulatory interventions.

## *Background*

The Campbell and Wallis Inquiries adopted a perspective on financial markets and regulation drawn essentially from the conventional economic textbook analysis. It is worth reviewing the implicit and explicit assumptions that underpin that perspective and testing them against the knowledge gained from subsequent (and prior) research, evidence and events.

That (then) conventional approach involves a preference for allowing markets (and participants therein) to operate free of government intervention, except in certain circumstances – and even then it may well be that government intervention does not improve things. Underpinning this preference (apart from ideological reasons) is the argument that self-interested rational economic agents transacting in markets will lead to equilibrium outcomes involving prices which reflect preferences, opportunities and available information and which are conducive to an efficient allocation of economic resources.<sup>1</sup> This includes inter-temporal allocation of resources via financial

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<sup>1</sup> There are two “efficiency” concepts involved here. One is the view that competition will generate prices which by reflecting demand and supply lead to efficient allocation of resources. The other is what is known as

prices (interest rates etc) generated in markets for saving and investment. Situations in which there might be “market failure” to achieve those outcomes arise where there is imperfect information, externalities/spillovers, public goods, and monopoly power.<sup>2</sup> Some form of government intervention might be welfare improving in those circumstances. And, of course, some form of legal system is assumed to be given exogenously which defines and enforces property / ownership rights.

It is implicitly assumed that individual markets will tend to a stable equilibrium, and that this is also true of the economy (the collection of markets) as a whole. Speculation and arbitrage activities will act in a stabilizing manner. The “invisible hand” of the market will lead towards an optimal allocation of resources which cannot be bettered by government dictate – although recognition of various market frictions, rigidities, and imperfections may lead to less than full employment of resources and justify government macro-economic policies.

Businesses<sup>3</sup> may come and go in line with Schumpeter’s description of “creative destruction” of the competitive process prompting “dynamic efficiency”. Business enterprises may involve agency problems (managers pursuing their own objectives rather than those of owners, or owners pursuing strategies that transfer wealth to themselves from other stakeholders), but these can be resolved by appropriate incentive structures and contractual arrangements (or perhaps reputational considerations). When businesses fail they exit gracefully, not creating disruption, and resources released are quickly absorbed elsewhere in the economy. (The Geneva Report (2010) on the “The Fundamental Principles of Financial Regulation” puts considerable emphasis on the externalities associated with financial institution failures). The “positive” rather than “normative” focus of such analysis also means that distributional issues are not considered – other than to conclude that if the market outcome is undesirable in that regard, the appropriate intervention is via distortion-minimizing tax and transfer systems rather than through intervention in particular markets.

**A Digression:** But it should be noted that the “positive” – ideology free interpretation of economics is open to challenge, as outlined in an excellent article by Sandel (2013) which, among other things, points out that economics provides no guidance on what transactions should be determined by market rather than guided by moral / non-market norms. And creating markets or monetary charges can affect the perceptions (of at least some) about the underlying morality – for example where imposing fines for unacceptable behaviour (littering, pollution, parking in disabled spaces, late child-care pickups) lead to some interpreting a fine as a possible “fee” rather than adopting behaviour consistent with social norms). Examples he uses to illuminate the issues include: markets for sex; child-bearing; human organs and blood; trade in “walrus-killing” hunting rights assigned to the Inuit on the basis of traditional tribal norms; tradeable refugee quotas. A basic point is that creating new markets may influence, or create conflicts with existing non-market social norms. “Standard

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the Efficient Markets Hypothesis (EMH) popularized by Fama (1970) which argues that available information will be rapidly incorporate into financial prices. Those concepts are linked if it is also argued that available information and thus financial prices reflect “fundamentals” rather than speculative, or other, factors.

<sup>2</sup> The externalities typically considered are “real” rather than “pecuniary” externalities where the latter refer to impacts on market prices. Notably, pecuniary externalities are a major component of many recent analyses of the financial/economic system where financial frictions are assumed to exist.

<sup>3</sup> Coase provides an explanation for the creation of business firms based on the benefits of internalizing some transactions within a hierarchical control structure rather than using market based transactions – prompting the very relevant analysis of the determinants of the “boundary of the firm”. Another relevant issue is the benefits which arise from using business structures – such as the limited liability of the corporate form.

economic reasoning assumes that commodifying a good—putting it up for sale— does not alter its character; market exchanges increase economic efficiency without changing the goods themselves” (Sandel, 2013). While these examples are perhaps somewhat distant from financial markets (although tradeable emissions permits spring to mind!) one aspect of the evolution of the financial sector is innovation in potential markets – whose social merits may need to be carefully considered.

There is a lot to like about the hypothetical world of standard economics – but whether it reflects reality (or, perhaps more importantly, generates predictions which are consistent with reality) and thus provides guidance for good policy is at least open to debate. That is particularly the case when the financial sector and its regulation are considered. There is a wealth of theoretical and empirical analysis and research which indicates that a more pragmatic view of how financial markets operate is required.

There is also the evidence (eg Reinhart and Rogoff, 2009) of numerous cases of financial and banking crises, of which the GFC is just the latest, that suggest that financial markets do not operate smoothly – as the textbook model would have us believe. Of course, those experiences can be interpreted differently. At one extreme the causes can be sought in inappropriate government interventions and policies which distort incentives and decision-making. At the other extreme, the causes can be found in the gross divergence of reality of financial markets from the assumptions of the textbook models and consequent expectation of instability and sub-optimality of free markets. The “truth” (if there is one) most likely lies in between these extremes, but with two unfortunate consequences. First, there is not a well-developed comprehensive, alternative, to the logically elegant, if practically challenged, textbook model which generates a comprehensive suite of policy prescriptions or simple rule for interventions.<sup>4</sup> Second, the dynamic evolution of the financial sector (such as reflected in Kane’s “regulatory dialectic” – regulation begets innovation begets different regulation and so on) means that some stable, time-invariant, optimal regulatory structure should not be expected. (This “truism” is also reflected in “Goodhart’s law” regarding macroeconomic policy – that basing policy on a hitherto stable economic relationship will lead to that relationship breaking down due to the change in behaviour induced).

### *Unpicking the components*

It is useful to examine the components of the textbook model individually to consider what research over the last two decades or so has to say about those components and the implications for financial markets. The components can be listed as follows:

1. Individuals are self-interested rational decision-makers. This is subject to challenge by behavioural economics/finance drawing on research from psychology.
2. Markets will lead to price outcomes where supply equals demand. This is challenged by the literature emphasizing the importance of asymmetric information and consequences such as credit rationing, and outcomes which have distributional consequences.
3. Firms will not have financial structures which unnecessarily expose them to risk of failure. This is not supported in the case of banks by a long literature emanating from the theoretical models of Diamond and Dybvig (1983) and Bryant (198x) showing potential for bank runs.

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<sup>4</sup> The prescriptions and rules are actually not straightforward – showing that there is “market failure” does not demonstrate which, if any, form of government intervention will lead to better outcomes.

There is also a literature which argues that high leverage of banks is needed to create “financial fragility” of balance sheets needed to ensure appropriate incentives for managers to appropriately monitor borrowers etc.

4. Firms which fail will exit gracefully without causing undue disruption. The spillovers from financial firm distress and failure are fundamental to many models of financial crises.
5. Financial prices incorporate available information which reflects “fundamentals”. This is challenged on a number of fronts. One is the potential for “bubbles”. Another is that prices may reflect “cash in the market” pricing or “limits to arbitrage” where participants are constrained via liquidity considerations.
6. Required rates of return on financial assets reflect differences in risk, and market equilibrium means that prices adjust such that expected rates of return equal required rates of return. The problems include: ongoing debate over whether there is any asset pricing theory (CAPM, Fama-French etc) which is supported by the data; inconsistency of the historical average of the market risk premium (equity returns in excess of the risk free rate) with generally accepted measures of individual risk aversion.
7. Externalities are of limited importance for the smooth functioning of markets. There are a number of analyses which indicate that pecuniary externalities (ie price effects) can lead to “vicious circles” in financial markets
8. The economy can best be analysed from a physics-like perspective of equilibrating markets with shocks generating disequilibria in one market being spread to other markets and inducing equilibrating price and quantity adjustments. This is challenged by the view that a better framework for analysis is that of networks – with shocks potentially being moderated or amplified, dependent on the network structure, as they are transmitted through the network.

The Global Financial Crisis has prompted increased research into these issues, although many of the issues had been common in the literature for several decades. The following as a brief and necessarily selective overview of some aspects of that literature – which is subject to ongoing evolution and debate.

### **Behavioural Finance and Economics**

Behavioural economics / finance, which draws on psychology, poses a significant challenge to the conclusions of traditional analysis based on the assumption of rational economic persons. It has been able to provide explanations for a range of behaviours and market features which traditional analysis cannot explain. (Critics, however, tend to argue that while each anomaly can be explained by some particular “tweak” to the assumption of rationality, this is an ad hoc approach, and there is no unifying framework which accounts consistently and comprehensively for the observed anomalies). Among the features of the behavioural approach are use of concepts such as: framing; mental accounts; prospect theory; loss aversion; overconfidence; overreaction.

There are a number of surveys of behavioural finance such as in Thaler and Sunstein, Barberis and Thaler, Shefrin, Ritter.

One response of conventional economics to the behavioural school is that as long as there are sufficient rational economic agents, the main conclusions are unaffected. The argument is that prices will still be determined by the actions of the rational agents, and that “irrational” participants

will be arbitrated out of markets over time due to losses made. Whether there are sufficient rational agents not subject to behavioural biases is open to debate. But there is also a significant literature (important to the derivation of many results related to market outcomes) which argues that there are “limits to arbitrage”, which implies that the effects of behavioural biases cannot necessarily be easily undone by “rational” traders. There is a range of theoretical papers demonstrating that, because “arbitrage” to take advantage of prices different from fundamentals is in fact “risk arbitrage”, it is not always possible nor optimal to do so. (Prices may deviate further from their fundamental values, and the ability of the rational trader to withstand the consequent wealth loss is limited) In a world of imperfect information, rational agents (hedge funds?) may not be able to obtain sufficient funds (or credit) to take arbitrating positions of the scale required.

Others, dismissive of the behavioural approach, might argue that individuals “learn by doing”, but many financial decisions are one-off or infrequent with long lags before the merits of the decision can be assessed (if ever) – and a new “sucker” is born every minute. Lo (2005) attempts to reconcile behavioural finance with the EMT under the label of Adaptive Markets Hypothesis (AMT). He argues, drawing on neuro-economics research, that behaviour adapts, that individuals “satisfice” by deriving heuristics which work well for decision making, but that changes in the environment mean that those heuristics create behavioural biases which are eventually eroded over time. Allied to this is the effect of competition and innovation which leads to a changing market environment as an ongoing process. One consequence is that there may exist opportunities for active fund managers to beat the market.

Regardless, the existence of behavioural biases has significant implications for the approach of policy makers towards market regulation. Is it, for example, desirable to allow product design and marketing/information provision which exploits behavioural biases and leads to product and service purchases which are not in the best interests of the individuals concerned? What is the best form of government intervention to offset adverse effects of behavioural biases or effects of market failures: taxes/subsidies; prohibitions; compulsion; specification of default options; “nudging”<sup>5</sup>? Daniel et al (2002) after arguing that behavioural biases affect asset prices<sup>6</sup> “suggest two limited and related goals for public policy: (1) to help investors avoid errors, and (2) to promote the efficiency of the market” and discuss a number of policy options – recognizing that policy makers are also subject to behavioural biases.

One important policy consequence of recognising behavioural biases is that it may be very difficult to predict responses to government interventions. This suggests that where feasible, it may be appropriate to conduct experimental trials of proposed interventions (eg introducing choice of superannuation fund) with differences between the treatment group and a control group providing evidence to better assist the design of policy.

Campbell et al (2011) provide a good discussion of implications for approaches to consumer financial protection. One example is the potential for a situation of zero transaction account fees and large overdrawn account fees to emerge in response to behavioural biases and involve cross-subsidisation from poorer to wealthier customers. Barberis (2013) refers to work which suggests that allowing

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<sup>5</sup> The title of a book by Thaler and Sunstein which promotes “libertarian paternalism” and evokes a wide range of predictable responses.

<sup>6</sup> See also Shiller (2003).

financial institutions to incorporate a lottery element into returns on deposit type accounts would, given behavioural biases, lead to increased savings.

### **Asymmetric Information and Financial Market Equilibria**

The consequences of imperfect information (particularly asymmetric information – where one party to a potential transaction knows more than the other) for market equilibria are heavily researched. This is an important issue for understanding financial markets because asymmetric information is inherent in most financial transactions. Unlike a market for commodities, where often quality can be observed, financial products involve future promises of cash flows – where the provider of the promise (seller of the asset or borrower) has superior information about the quality of that promise.<sup>7</sup>

One example is the “market for lemons” (Akerlof, 1970), typically described in the context of used cars. If purchasers can’t identify good from bad quality prior to purchase, the price will reflect average quality, and suppliers of good quality items will exit the market, driving the average quality and price down and inducing further suppliers (of items of quality above the new, lower, average) to depart the market. In the extreme, the market ceases to exist.

In practice, attempts to overcome the information problem occur, including mechanisms for suppliers to signal higher quality (credible guarantees) or purchasers to acquire information to identify quality. Where some private information is made public or shocks arrive which change perceptions of quality, market outcomes can change in a variety of ways. These include causing previously functioning secondary asset markets to freeze, as argued for example by Mahlebe (2013), who models how a change in demand for liquidity by institutions causes them to hoard particular assets, with the quality of assets supplied to the market perceived by potential buyers to be of lower quality and creating an adverse selection problem.

Easley and O’Hara (2010) provide an alternative explanation for market freezes based on traders having uncertainty about an asset’s value (such as having beliefs that it lies within some range, rather than a specific value). Consequently a quoted bid price within that range might be too low to induce them to sell, but a higher ask price also within that range is also too high to induce them to buy more. No trading may occur, and they argue that this creates problems for “mark to market” accounting requirements for asset values.

In financial markets, much activity (lending, insurance) requires finding better ways to identify and price relative risk of counterparties, and contracts may be designed to overcome adverse consequences of the information problem. For example, credit rationing (rather than offering larger loans at higher interest rates) can be explained in this way. And in aggregate, credit rationing can occur (rather than higher interest rates being charged) because the population of borrowers can become increasingly composed of higher risk borrowers, with adverse outcomes for lenders, when higher interest rates are charged.

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<sup>7</sup> The Wallis Inquiry used the “intensity of the promise” as a basis for determining the boundaries of prudential regulation – but whereas the promise is related to a specific financial product, their boundaries were drawn based on the institutions offering an intense promise – if even for only a small part of their products.

Arguably, improvements in information technology may work to reduce information asymmetry, but there remains the incentive of each party to a transaction to trade based on their private information, and not disclose that information.

### **Asset Pricing and Efficient Markets**

There is ongoing debate about the applicability of the Efficient Markets Hypothesis. There is much evidence that new information is impounded quickly into financial prices, such as from event studies of the impact of unexpected corporate announcements or regulatory change. However, those studies do not shine any light on whether the resulting prices reflect “fundamentals”, and thus provide a good guide to resource allocation, which is the main inference drawn from the EMH.

One challenge to the EMH has been the theoretical modelling of “limits to arbitrage” (eg Shleifer and Vishney, 1997), demonstrating that in markets with “noise traders” (irrational investors?), financial prices can deviate from fundamental values for significant lengths of time.

Brunnermeier et al (2012) review the role of frictions in finance, noting that temporary adverse shocks can have persistent macro consequences, because liquidity concerns and wealth distribution matter, and leverage, which is significant (because frictions make debt preferable to outside equity) can lead to financial distress, and rebuilding wealth through retained earnings can take significant time. Moreover amplification can occur through price and margin spirals due to liquidity risk. (One conclusion from some modelling is that a higher level of government bonds can be welfare improving because that is an increase in liquid assets!)

Franklin Allen and co-authors (eg Allen and Gale, 2005) have argued that financial prices can deviate from fundamentals because of “cash in the market” pricing. When shocks cause financial institutions to sell assets to obtain liquidity, there will be inadequate liquidity available from other participants to prevent asset price falls because holding liquidity is costly. Small shocks can lead to significant asset price movements which by affecting liquidity availability can amplify the effect further.

Another challenge has been empirical work, such as that by Shiller (see eg Shiller, 2003) demonstrating that equity prices are too volatile to be consistent with rational price determination via discounting of expected future dividends.

Haldane and May (2011) note that asset pricing theories which underpin derivatives pricing and the growth of trading rest on a set of idealized assumptions of “perfect competition, market liquidity, no-arbitrage and market completeness”, which imply that trading activities have no feedback effects.

Efficient market theorists have long argued that asset price bubbles cannot logically exist – and in simple (unrealistic?) frameworks which assume rational forward-looking agents and no imperfections this can be theoretically demonstrated. However, there are a number of alternative models not making such assumptions which can generate bubbles such as discussed in Allen and Carletti (2011).

### **Financial Fragility**

Once financial institutions engage in maturity transformation (liquidity production) they are exposed to the possibility of runs, unless the assets they hold can be sold or liquidated without loss of value. If not, then should holders of short term fixed value claims on the institution reach a view that it will not be able to meet its obligations, that view will be self-fulfilling.

Withdrawals of funds or refusal to roll over such claims will lead to a fire sale of assets to generate the required funds and a reduction in the value of assets available to meet claims. Because early withdrawers receive the promised amount (even though total assets are falling and reducing the likelihood that sufficient will be available to meet the claims of later withdrawers) there is an incentive to withdraw early – if it is perceived that others will do so. While this problem is typically associated with bank deposits (Diamond and Dybvig, 1983), it is a more general issue as can be seen from the problems facing unlisted mortgage and property trusts (where even though claims are not fixed in value, redemptions at values not reflecting subsequent post sale asset values create the same effect). Shleifer and Vishny (2011) explain that a similar outcome of “fire sales” can occur in the case of corporates where debt is collateralised and liquidity shortages mean that attempts to sell collateral lead to prices below the fundamental value. (This is relevant to choice of lenders between work-out versus liquidation arrangements, optimal design of corporate bankruptcy arrangements).

There are a range of mechanisms which can be used to ameliorate such a risk (albeit with possibly other adverse consequences). One is to provide government backed deposit insurance. A second is to preclude liquidity production by such institutions – requiring “matched funding” or holding only of liquid assets which can be readily sold without loss. A third is to require sufficient equity capital funding such that even at fire sale prices, assets will be sufficient to meet depositor claims.

### **Financial Instability**

Apart from the experience of the GFC and numerous prior crises (Reinhart and Rogoff, 2009) there is a wealth of theory illustrating how a shock can lead to financial instability via asset prices deviating from fundamental values and affecting financial flows. Shleifer and Vishny (2011) describe how arbitrageurs can become illiquid when a negative shock depresses asset prices (by, for example, investors withdrawing funds from professional managers due to poor returns) preventing them from acquiring assets available at fire sale prices – indeed aggravating the process via their own asset sales.

Brunnermeier and Peterson (2009) take this argument further by developing a model of a “margin-price spiral” outlined in simpler terms in Brunnermeier (2009). A reduction in asset values prompts margin calls by collateralised lenders (eg providers of repo finance) requiring the borrower to sell assets, putting further downward on asset prices and prompting further margin calls. In this model they refer to the first component –of reduced lender willingness to provide finance - as the “funding liquidity” aspect and the second component of reduced sale prices available for assets as the “market liquidity” aspect.

Among policy implications are attempts to reduce the likelihood of fire sales and resulting spirals – such as by requiring higher capital requirements, higher haircut and margin requirements on collateralised lending, liquidity requirements. Ex-post policy arrangements include access to the central bank discount window.

## Networks

Haldane and May (2011) provide a useful overview of the importance of focusing upon the “financial eco-system” and implications of the structure of the network involved. They use a simple example of banks with inter-bank liabilities and assets as well as loans to and deposits with end-users, and indicate how different types of shocks can propagate through the system, in ways dependent upon the inter-linkages between banks. These include: loss of assets due to a failure of a single bank counterparty; generalized “market liquidity” shocks reflecting a decline in asset values perhaps from “fire sales” by a failing bank; and “liquidity hoarding” by banks unwilling to extend loans in interbank markets. They suggest that available modelling indicates that the latter two have greater implications for amplification of the initial shocks, whereas the effects of the first tend to be dampened by virtue of losses being spread across a large number of counterparties. If all banks tend to be similar, then the systemic risks are increased (“homogeneity breeds fragility”).

Haldane and May draw several regulatory implications from using network analysis. First, higher capital and liquidity ratios reduce the propagation effects. Second, the determination of those ratios is perhaps better linked to the likely propagation consequences (spillovers) rather than to the idiosyncratic risks of the bank relevant to its individual failure (as in the current risk weights approach). This implies higher regulatory requirements for systemically important banks which are the main nodes in the financial network and potentially “super spreaders” of shocks. Third, inhibiting the potential for the initiating shocks by macro-prudential regulation is also a policy option. Fourth, redesigning the network such as by requiring central clearing counterparties for OTC derivatives (generating a “hub and spoke” pattern rather than complex, opaque, interrelationships) may also reduce systemic risk. Fifth, increasing modularity, such as by limits on activities within specific organisations (ring fencing, Volcker rule) may also reduce propagation effects.

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