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Hybridising the Schenkerian Method: A Selected Section of the First Movement of Paul Hindemith's Piano Sonata No. 1 as a Case Study

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This article considers two major theories, the Neo-Riemannian theory—commonly abbreviated as NRT—and the Schenkerian method, and proposes that a synthesis of them could provide useful insights into the analysis of Neo-Classical music, taking the Piano Sonata No. 1 Paul Hindemith (1895–1963) as a case study. Hindemith's background harmonic structure in this work is primarily tonal, inviting the use of a theoretical model that might partake in large-scale melodic reduction, such as Schenkerian analysis. His foreground harmonies, however, are largely post-tonal, and this proves challenging if approached by traditional tonal harmonic analysis. Calculating voice-leading (VL) movement at the foreground level may assist in elucidating the composer's harmonic language,[1] revealing some components that are attenuated or marginalised in a Schenkerian analysis.

This article appraises the two theories and examines existing research that has sought to integrate and synthesise them. This is followed by a short discussion detailing some brief approaches to analysis and its relationship to performance. Furthermore, as Hindemith was also a theorist, his *The Craft of Musical Composition* provides his thoughts on compositional

[1] The foreground level of a Schenkerian analysis identifies the immediate melodic features and patterns and considers the deeper levels of structure.

techniques, and these have provided the basis to identify the melodic features and perform a comprehensive segmentation and rhythmic reduction of the sonata.[2]

The hybrid analytical method is then demonstrated through an analysis of the first four bars of the Piano Sonata's first movement: firstly, through a preliminary Schenkerian analysis; secondly, segmentation through Hindemith's compositional ideas; and thirdly, through hybrid charts that integrate the *Urlinie*,[3] pitch collections and *Bassbrechung*,[4] along with graphs that illustrate the voice-leading movements against the *Urlinie*. This will be supported by a discussion of the results and their implications for both performance and analysis, uncovering ways in which the voice-leading data can enrich the Schenkerian chart and making further observations arising from this analytical method.

Existing Studies on Hindemith's Works

There are many scholarly works on Hindemith's music, some of which delve into his compositional treatises, some on the application of Hindemith's own compositional theories to their analyses, and others with a more specific focus on analysing certain musical elements: metre, harmony and texture.

More work has been done on Hindemith's larger works as opposed to his solo pieces. There is, however, one article by Nevin Harner that analyses the Third Piano Sonata, but none for the first two sonatas. Harner covers several musical elements: form and thematic usage, 'vertical structures,' harmony, tonality, melody, and rhythm.[5] A study by Simon Wildman involves a comparative analysis of Hindemith's Sonata for Bassoon and Sonata for Tuba, with a focus on melodic or phrase designs, harmony and structure.[6] These late works are also discussed alongside *The Craft of Musical Composition* as they are typical of Hindemith's compositional framework.[7] Similarly, another work by Melody Bedell examines Hindemith's Clarinet Concerto alongside the *The Craft of Musical Composition* to observe how his laws of composition can be reflected in his works.[8]

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[2] Hindemith's main objective in the treatise was to seek out an organised musical language that 'will embrace both twentieth-century harmonic developments and the vocabulary of traditional harmony.' See Ian Kemp, *Hindemith* (London: Oxford University Press, 2002), 15. This was approached from an acoustical view, understanding the natural characteristics of tones, developing new scales (Series 1 and 2), reorganising chord groups according to their harmonic tension, and taking a different perspective to the theory of melody. See Paul Hindemith, *The Craft of Musical Composition* (London: Schott, 1941), 14–197; and Kemp, *Hindemith*, 35–9.

[3] The *Urlinie* (or melodic reduction) is a stepwise soprano line beginning on a degree of the tonic triad other than degree 1 and concluding on degree 1. It has three forms: ^3–^1 ('3 line'); ^5–^1 ('5 line'); and ^8–^1 ('8 line'). The first degree of the *Urlinie* is called the *Kopfton* (head tone).

[4] The *Bassbrechung* (or bass reduction) is a bass voice counterpointing the *Urlinie*, which proceeds from I to I via V. V normally occurs beneath ^2 of the *Urlinie*.

[5] Harner particularly focusses on how these 'vertical structures' (the study of the sonorities, how dissonant, how complex, etc.) can be seen across all four movements and, from this, how they can inform the performer and listener of the underpinnings of the sonata. See Nevin L. Harner, 'Hindemith: Third Piano Sonata. An Analysis' (MA thesis, University of Rochester, 1962), 1–73.

[6] Simon R. Wildman, 'A Comparative Analysis of Paul Hindemith's Sonata for Bassoon (1938) and Sonata for Tuba (1955)' (DMA thesis, University of Georgia, 2014), 7–33.

[7] Wildman, 'A Comparative Analysis,' 34–49.

[8] Bedell concludes that construction of the Clarinet Concerto was consistent with Hindemith's laws of composition, particularly in his rules of melody and harmony as set out by the contrasting themes in the first and fourth movements and the step-progressions of the themes in the third movement. See Melody Joy Bedell, 'The Craft of Musical Composition Applied to Hindemith's Clarinet Concerto' (MMus thesis, University of Tennessee, 1985), 5–22.

An interesting study by Sun Hee Kim applies Hindemith's theories to Niels Bentzon's Third Piano Sonata, identifying how the work is a reflection of Hindemith's ideas and examining the relevance of his theory as a tool for analysing the sonata.[9] Furthermore, a study by Pamela Flory discusses the relationship between analysis and performance through Hindemith's compositions, taking an approach from a choral conductor's perspective to provide a rationale for an analytical study for performance and a practical guide for conductors to prepare the work.[10]

A different approach by Domenico Trombetta investigates the origins of Hindemith's interest in early music and how it can be reflected in his viola compositions: Viola Sonata op. 11, no. 5; op. 31, no. 4; the Viola Concerto *Der Schwanendreher*; and *Trauermusik* for Viola and Strings.[11] His findings indicate that Hindemith's knowledge and practice of early music played a crucial role in his compositional output, particularly in his use of fugue, chorale setting and cantus firmus-like melodies.[12]

Whilst some scholars have placed an emphasis on establishing a close relationship between *The Craft of Musical Composition* and Hindemith's works, other scholars have investigated how Hindemith manipulates a specific musical element within his compositions. For instance, Kevin Uppercue's study focusses on examining Hindemith's approach to intervals and presents an analytical method for 'Neo-Tonal' music based on Hindemith's and Etler's writings, applied to *Ludus Tonalis*.[13] He establishes a theory of 'interval resolution,' a gradation that orders intervals from the most stable to the most unstable and how specific intervallic treatments permeate various levels of structure.[14] Separate research by Siglind Bruhn also examines the formal structure of *Ludus Tonalis*, uncovering its structural devices, symmetry and asymmetry.[15] Bruhn discovers that the postlude is a 'visual retrograde inversion of the prelude,' as frequently stated in the literature, and that the two fugues 'using mirror-reflection strike the eyes of most people who spend time with the score.'[16] Similarly, Yung Cheung Mak approaches Hindemith's music from a rhythmic perspective, examining how Hindemith 'manipulates metrical conflict in certain passages for particular purposes, for instance, to prepare for a change of tonality or

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[9] Kim concludes that one of the key reasons Hindemith's tonal theory is applicable to the sonata is that Bentzon utilises rhythmic and melodic devices from the Baroque tradition. The work is unified through motivic development and devices such as ostinato, pedal point and counterpoint are evident. See Sun Hee Kim, 'An Analytical Study: Applying Hindemith's Tonal Theory to Niels Viggo Bentzon's Third Piano Sonata, Op. 44' (DMA thesis, University of North Texas, 2009), 1–9.

[10] Flory identifies that it is imperative for the conductor to have a comprehensive knowledge of Hindemith's style, 'textual purpose,' as well as performing an analysis on the respective pieces 'in order to achieve the best possible performance.' See Pamela Jean Flory, 'Six Chansons of Paul Hindemith: An Analysis in Relation to Performance' (BM(Hons) thesis, Butler University, 1970), 14–34.

[11] Domenico L. Trombetta, 'Early Music Influences in Paul Hindemith's Compositions for the Viola' (DMA thesis, James Madison University, 2014), 5–41.

[12] Trombetta, 'Early Music Influences,' vii.

[13] Kevin Uppercue, 'Modified Contrapuntal Conventions: Stability and Instability in the Neotonal Music of Hindemith' (MMus thesis, University of North Carolina, 2013), 9–37.

[14] Uppercue's findings indicated that this theory is a starting point for 'the analysis of intervallic content and its function within a given setting' and consideration of 'all levels of structure' is required to 'provide a thoughtful analysis of Neo-Tonal music.' See Uppercue, 'Modified Contrapuntal Conventions,' 9–45.

[15] Siglind Bruhn, 'Symmetry and Dissymmetry in Paul Hindemith's *Ludus Tonalis*,' *Symmetry: Culture and Science* 7, no. 2 (1996): 116–32.

[16] Bruhn, 'Symmetry and Dissymmetry,' 132.

the entry of a subject, to create points of tension, to intensify the build-up of a climax and to provide a link between sections.'[17]

As there is an evident gap in the existing literature, where some of Hindemith's works are yet to be examined, analysing his Piano Sonata no. 1 in this article will also serve to help fill this scholarly lacuna. There is a need for studies to be carried out that discuss the background structure and how the middleground level details relate to it. [18]

Integrating Schenkerian and Neo-Riemannian Theories

What sort of approach or tool would one use to analyse music that simultaneously engages with tonal and chromatic systems? Two possible methods are the Schenkerian method and NRT.

The Schenkerian method is commonly known as an effective tool for analysing tonal music, particularly music from the Baroque to the early nineteenth century, whilst Neo-Riemannian theory is particularly useful for examining music from the nineteenth century and early twentieth century. When used separately, these two methods will provide different insights and address different issues within the music. The strength of each analysis is highly dependent on two key factors: the period of the chosen work and the specific analytical focus.

A Neo-Riemannian analysis examines the relationship of chords to each other at a foreground level whereas Schenkerian analysis examines the relationship of chords to the melodic and harmonic structures at a background and middleground level. Rather than adhering to the traditional principles of the Neo-Riemannian method, this investigation reveals that drawing out the core Neo-Riemannian elements and then using them in conjunction with the Schenkerian method can produce an effective way to analyse music that contains an extended harmonic language yet retains its tonal centricity. Neo-Classical music is one such example. A trend flourishing after the Great War, Neo-Classicism has roots embedded in Classicism and Primitivism—the creation of new sounds by juxtaposing them with old ones—and as a reaction to Impressionism, Expressionism and late Romanticism. In Scott Messing's words, Classicism and Neo-Classicism are much alike where there is 'clarity, simplicity, objectivity, purity, refinement, constructive logic, concision, sobriety, and so on.'[19]

Although there are studies that engage in the criticism of theoretical models including the Schenkerian method, a small number of existing works demonstrate how and why synthesising elements from different methods and perspectives—such as Schenkerian method, Neo-Riemannian Theory and motivic analysis—can be of great use in studying musical works.[20] One question provoked by this hybridisation is whether they are, as assumed, opposites or, if used carefully, can one complement the other. As Steven Rings states:

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[17] Mak discovers that the concepts of metrical consonance and dissonance are a 'good way' to categorise the rhythmic interest in Hindemith's music. See Yung Cheung Mak, 'Formal Functions of Metrical Dissonance in the Music of Paul Hindemith' (MA thesis, University of British Columbia, 1999), 1.

[18] The middleground level from a Schenkerian approach reproduces aspects from the foreground analysis on a larger scale.

[19] Scott Messing, *Neoclassicism in Music: From the Genesis of the Concept through the Schoenberg/Stravinsky Polemic* (Rochester: University of Rochester Press, 1988), xiv.

[20] A common criticism of the Schenkerian method is that it is very 'subjective'; this method ultimately reflects the analyst's musical perceptions and intuitions, and evidently, despite the benefits of utilising the Schenkerian approach, the analysis will have a narrow focus. See Anca Preda-Ulita, 'Adaptations of the Schenkerian Analysis to Post-Tonal Music,' *Transylvania University of Brasor Series VIII: Performing Arts* 6, no. 55 (2013): 85–91.

> does neo-Riemannian theory represent an "alternative" to such theories or an adjunct to them? Put more pointedly, are neo-Riemannian and Schenkerian methods in competition with one another, or are they potentially complementary, how might they best interact in analytical praxis?[21]

Using both Schenkerian and neo-Riemannian methods can be challenging and potentially problematic, but work by Elizabeth Sayrs, Jonathan Plotkin, Jonathan Pieslak, Deborah Rifkin and René Rusch has demonstrated that it can enlighten and provide useful perspectives on music.[22] It is also interesting to point out that both Sayrs's and Plotkin's work expands on the Schenkerian approach or NRT through combining it with another approach, not Schenkerian and NRT together. Steven Baker's work on some selected sections of Wagner's *Parsifal* more explicitly states the use of both a Neo-Riemannian and Schenkerian approach for his investigation.[23]

Whilst some literature integrates existing analytical approaches, there are more studies that have focussed on a single analytical approach. Richard Cohn, Per Broman, Miguel Ramirez, and Dmitri Tymoczko utilise NRT to reveal much about late-Romantic triadic progressions, voice-leading connections, set-class consistency and how this theory can bridge the gap between tonal and atonal techniques in theory pedagogy.[24] It is particularly interesting to observe, however, that—with the exception of Broman who discusses pedagogical aspects—these papers do not directly mention how it can be applied to other musical practices.

Studies by Chizuko Asada, Walter Everett, Jeffrey Swinkin, Karl-Otto Plum and William Drabkin strongly suggest that Schenker's method can also be utilised as a performance tool.[25] Asada's analysis of Scriabin's Sonata no. 9 promotes this idea and suggests significant implications particularly for performers as the method helps to determine where the climax of the piece occurs and the respective roles of each note.[26] Similarly, Everett's study strongly promotes the notion that the Schenkerian approach is well suited to analyse the feeling of grief in Schubert's *Winterreise*.[27] By performing this analysis on the songs in *Winterreise* and

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[21] Steven Rings, 'Perspectives on Tonality and Transformations in Schubert's Impromptu in E-flat, D. 899, no. 2,' *Journal of Schenkerian Studies* 2 (2007): 33.

[22] Elizabeth Paige Sayrs, 'Approaches to Wolf: Schenker, Transformation, Function' (PhD thesis, Ohio State University, 1997); Jonathan Robert Pieslak, 'Conflicting Analytical Approaches to Late Nineteenth- and Early Twentieth-Century Tonal Music: A Meta-Theoretical Study' (PhD thesis, University of Michigan, 2003); Richard James Plotkin, 'Transforming Transformational Analysis: Applications of Filtered Point-Symmetry' (PhD thesis, University of Chicago, 2010); Deborah Rifkin, 'A Theory of Motives for Prokofiev's Music,' *Music Theory Spectrum* 26, no. 2 (2004): 265–90; and René Rusch, 'Schenkerian Theory, Neo-Riemannian Theory and Late Schubert,' *Journal of the Society for Musicology in Ireland* 8 (2012–2013): 3–20.

[23] Steven Scott Baker, 'Neo-Riemannian Transformations and Prolongational Structures in Wagner's "Parsifal"' (PhD thesis, Florida State University, 2003).

[24] Richard Cohn, 'Maximally Smooth Cycles, Hexatonic Systems, and the Analysis of Late-Romantic Triadic Progressions,' *Music Analysis* 15, no. 1 (1996): 9–40; Per F. Broman, 'Reger and Riemann: Some Analytical and Pedagogical Prospects,' *Svensk Tidskrift för Musikforskning* [The Journal of the Swedish Musicological Society] 84 (2002): 13–25; Miguel Ramirez, 'Chromatic-Third Relations in the Music of Bruckner: A Neo-Riemannian Perspective,' *Music Analysis* 32, no. 2 (2013): 155–209; and Dimitri Tymoczko, *A Geometry of Music: Harmony and Counterpoint in the Extended Common Practice* (New York: Oxford University Press, 2011).

[25] Chizuko Asada, 'Schenkerian Analysis of Sonata no. 9, op. 68 by Alexander Scriabin,' (MMus thesis, California State University, 1997); Jeffrey Swinkin, 'Schenkerian Analysis, Metaphor, and Performance,' *College Music Symposium* 47 (2007): 76–99; Karl-Otto Plum and William Drabkin, 'Towards a Methodology for Schenkerian Analysis,' *Music Analysis* 7, no. 2 (1988): 143–64; and Walter Everett, 'Grief in "Winterreise": A Schenkerian Perspective,' *Music Analysis* 9, no. 2 (1990): 157–75.

[26] Asada, 'Schenkerian Analysis of Sonata no. 9, op. 68, 37–8.

[27] Everett, 'Grief in "Winterreise",' 157–75.

considering the lyrical content, Everett is able to demonstrate the specific motives and figures that illustrate the idea of grief. Plum and Drabkin also support the notion that performing the Schenkerian analysis will help improve the performer's approach to the music as well as clarifying the voice-leading structure for listeners, performers, and researchers.[28] The study provided a way to standardise the criteria by which Schenkerian voice-leading analyses are produced, providing an explanation of the passing passages rather than treating them as an ambiguity. The notion that the Schenkerian method is useful for performance is further reinforced in Swinkin's work, which strongly encourages the close ties between Schenkerian analysis and performance.[29]

The concept of relating analysis to performance is becoming increasingly important in theoretical and analytical disciplines. This has been discussed by many theorists, ranging from Janet Schmalfeldt's work on Beethoven's *Bagatelles* to Nicholas Cook's study on 'Analysing Performance and Performing Analysis.'[30] Other scholars such as Jonathan Dunsby, Tim Howell, John Rink, Schmalfeldt and Annie Yih have also worked towards creating a balanced relationship between performance and analysis and demonstrated how a performer's analysis is of vital importance in understanding the work.[31]

It is evident upon examining the existing literature that these theories have the potential to provide deeper musical insights when used in tandem through the understanding of musical language and stylistic and historical context. The existing studies combining these methodologies have not exhausted all the possibilities of this analytical approach; indeed, few studies step beyond methodological reflection. This article therefore synthesises these methodologies, applying the hybrid method to a single genre and revealing a deeper insight to these works, all with the aim of relating the findings to a broader historical context and how it can be incorporated into performance practice.

Methodology

A method of analysis can be created that is appropriate for Neo-Classical composers—and potentially other post-tonal composers—and embodies significant Schenkerian characteristics yet draws on NRT-inspired elements to obtain a detailed harmonic analysis. If the use of one method creates one dimension of experience, it is interesting to examine how the co-existence of two different methods assists in the understanding the music and how this can be used to aid performers.

A flexible application of the Schenkerian method to the first movement of Hindemith's Piano Sonata no. 1 identifies A as its tonal centre, which is clearly defined at 'cadential' moments

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[28] Plum and Drabkin, 'Towards a Methodology for Schenkerian Analysis,' 143–64.

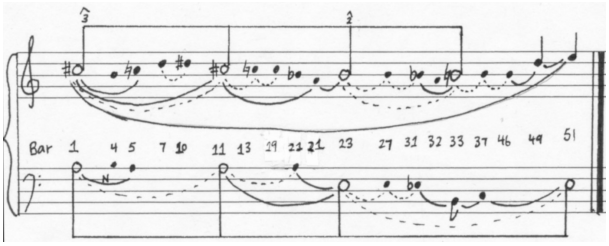
[29] Swinkin, 'Schenkerian Analysis, Metaphor, and Performance,' 76–99.

[30] Janet Schmalfeldt, 'On the Relation of Analysis to Performance: Beethoven's "Bagatelles" op. 126, nos. 2 and 5,' *Journal of Music Theory* 29, no. 1 (1985): 1–31; and Nicholas Cook, 'Analysing Performance and Performing Analysis,' in *Rethinking Music*, ed. Nicholas Cook and Mark Everist (Oxford: Oxford University Press, 1999), 239–62.

[31] Jonathan Dunsby, 'Guest Editorial: Performance and Analysis of Music,' Music Analysis 8, no. 1–2 (1989): 5–20; Tim Howell, 'Analysis and Performance: The Search for a Middleground,' in Companion to Contemporary Musical Thought, ed. John Paynter, Tim Howell, Richard Orton and Peter Seymour (New York: Pendragon, 1992), 692–714; John Rink, 'Review of Berry,' Music Analysis 9, no. 3 (1990): 319–39; Schmalfeldt, 'On the Relation of Analysis to Performance,' 1–31; and Annie Yih, 'Connecting Analysis and Performance: A Case Study for Developing An Effective Approach,' Gamut 6, no. 1 (2013): 277–308.

and reinforced at bars 1 and 11, concluding on the dominant chord of A. Furthermore, as it is the middleground level that reveals the different layers and voices between foreground and background levels and holds the most interest for the analyst, a middleground level analysis is performed and similar issues occur, in which the harmonies cannot be analysed from a traditional Classical approach (for example, using Roman numerals). It is clear from the loose application of this method that we do not get a sense of the harmonic movement and what goes on exactly between each set of sounds. Analytical Chart 1 shows a detailed *Ursatz* of the first movement; the *Ursatz* (fundamental structure) comprises the *Urlinie* and *Bassbrechung*.[32]

Analytical Chart 1. *Ursatz* of the first movement



The sketch of the *Bassbrechung* identifies the main key centres but reveals little information about the harmonic movement and its core arpeggiation. Thus, although a Schenkerian view can partially be accomplished, the harmonic details are evidently incomplete, and as the vertical sonorities contain notes that cannot be firmly identified in a major or minor context, we need to turn alternate methods: an NRT-inspired approach, acknowledging the importance of minimal voice-leading movement.

However, to justify which chords should be studied for investigation, Hindemith's musical idea of step progressions is applied to the work.[33] Step progression, according to Hindemith, is the primary rule of 'melodic construction' where the 'main' tones of a melody must move in 'seconds.' This technique identifies all the melodic activity within a passage and longer-range connections within a section or across the entire work. Analytical Chart 2, depicting bars 1–4 of the first movement, exemplifies this segmentation.

The notion of maximally smooth voice-leading efficiency, a key principle from NRT, is then applied rather than conventional Neo-Riemannian tools such as the *Tonnetz*, a graphical representation depicting the transformations of chord progressions (see Figure 1).[34] The highlighted chords or pitch collections—drawn from the rhythmic reduction—are written on a single staff in a closed position. Each note is then converted into its pitch-class equivalent, and the numbers are then placed directly above the notes. Subsequently, the amount of intervallic movement between each set of pitches can be determined by the smallest number of semitones. 'Minimal' movement has been prioritised, as one of NRT's core principles is to seek maximally smooth motion from one chord to the next, bearing a strong resemblance to a typical SATB harmony exercise, where there is an emphasis on smooth voice-leading.[35]

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[32] See footnotes 3 and 4 for further information on the *Urlinie* and *Bassbrechung*.

[33] Hindemith, *Craft of Musical Composition*.

[34] Joseph N. Straus, 'Voice Leading in Set-Class Space,' *Journal of Music Theory* 49, no. 1 (2005): 45–108.

[35] Cohn, 'Maximally Smooth Cycles,' 9–40.

Analytical Chart 2. Segmentation, rhythmic reduction, pitch collections and calculating VL distance in bb. 1–4

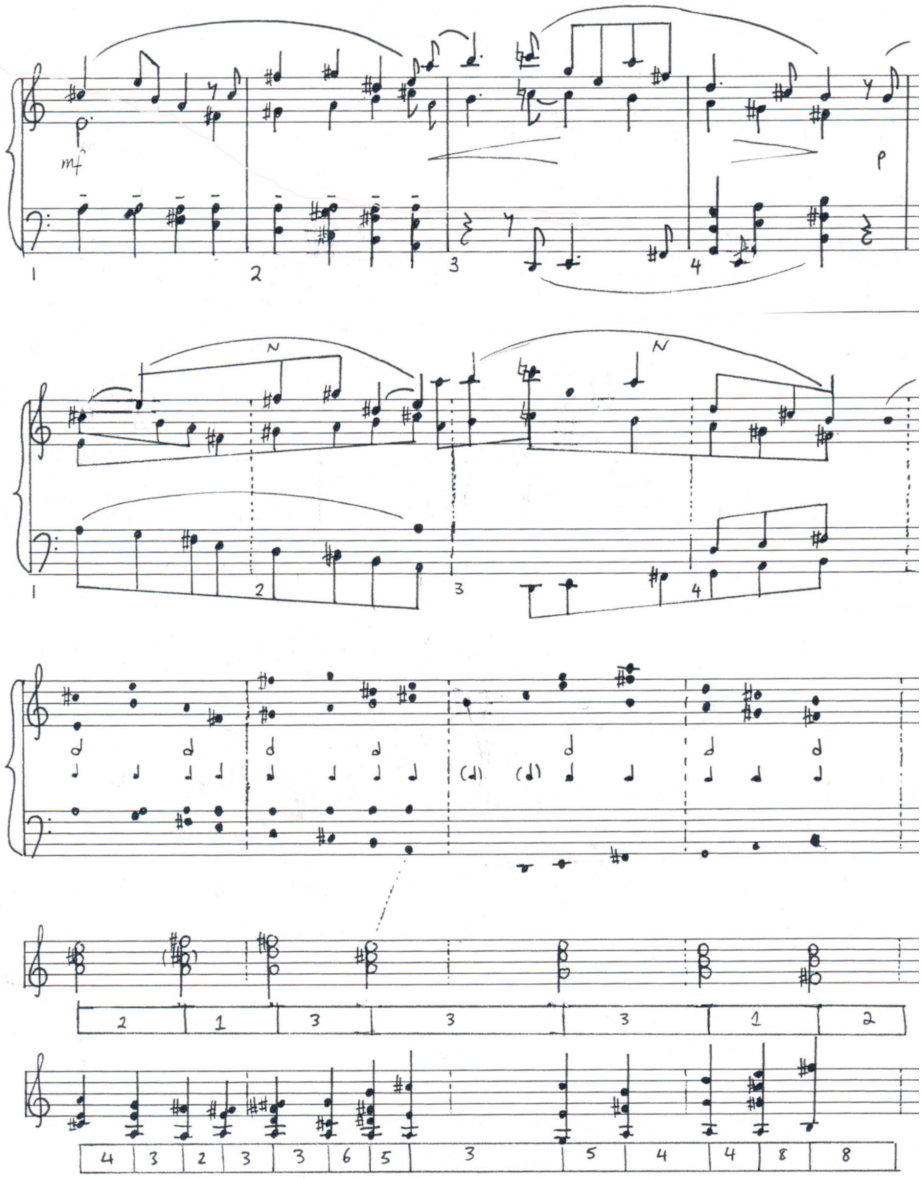


Figure 1. Calculating the intervals between two sets of pitch collections

Pitch Collection 1	
F#	6
A	9

Movement
2
0
0

Pitch Collection 2	
E	4
F#	6
A	9

The data can then be categorised in three different ways to examine its role and effect on the music: the 'unordered' combination of numbers between each voice within the pitch collection;[36] the 'ordered' combination of numbers between each voice within the pitch collection— from smallest to largest—known as the 'basic interval pattern' and abbreviated as 'BIP';[37] and the total amount of intervallic movement between each pitch collection.[38]

The second and third sets of data can be arranged into a table, listing the range of intervallic movement between each pitch collection, the number of occurrences, the respective BIP and its specific number of occurrences. This would be done on a local level—key sections and ideas—as well as on a general level so that one can examine the frequency of a particular BIP across different sections of a piece. For example, if one BIP is more frequent than others, it is worth closer examination. This could potentially have an effect on the idea of tension and release within the phrase structure. For instance, it can be hypothesised that a series of uniform intervallic movements could indicate a sense of harmonic stability and more varied intervallic movements could evoke a sense of instability.[39]

Two different types of visual representation will be used to illustrate the relationship that can be established between the Schenkerian and Neo-Riemannian approaches. The first of these bears some resemblance to a typical Schenkerian chart, whilst the other is in the form of a graph, a visual display of the data gathered from the pitch collections.

Figure 2 shows the framework for a modified chart, which combines the core elements of the Schenkerian analysis and the NRT-inspired approach. In order to integrate the groups of pitch collections, the melodic and bass reductions (modified perceptions of *Urlinie* and *Bassbrechung*), the various sets of pitch collections are placed on a separate system between the melodic and bass reductions, linking each respective point with chords and bar numbers.

Figure 2. An example of a modified Schenkerian and NRT chart

By placing these pitch collections on their own staff in the middle of the system, it is possible to examine how the melodic reduction is supported by the progression of pitch collections as

[36] The 'unordered' combination of numbers is essentially an unaltered presentation of respective voice-leading movement between each pitch collection.

[37] The 'ordered' combination of numbers—an ordered presentation of the horizontal, voice-leading movement between each pitch collection—is where interesting observations can be made, as these ordered sets of numbers can then be compared to other sections of the piece.

[38] The total amount of intervallic movement comprises the total of the respective voice-leading movements within each pitch collection. This data will later be particularly useful in creating a graph that charts the amount of harmonic movement across the entire piece.

[39] Eugene Narmour, 'On the Relationship of Analytical Theory,' in *Explorations in Music, the Arts, and Ideas: Essays in Honor of Leonard B. Meyer*, ed. Eugene Narmour and Ruth Solie (Stuyvesant, NY: Pendragon Press, 1988), 321–334; and Eugene Narmour, *The Analysis and Cognition of Melodic Complexity: The Implication-Realization Model* (Chicago: University of Chicago Press, 1992).

well as the bass reduction.[40] Hence, this additional system enriches the details of the initial Schenkerian chart (refer to Appendices A and B for the foreground, middleground and background sketches). A table is inserted directly below the chart detailing the data obtained from calculating the various aspects of voice-leading and intervallic movement against the bar numbers of the piece.

The process of rhythmic reduction parallels the Schenkerian method, where a hierarchy of rhythms can be established from larger to smaller rhythms. The way in which one segments the music depends heavily on the time signature as well as identifying the accentual patterns: structural downbeats and attack points.[41] As such, two different sets of Schenkerian and NRT charts are employed, one with the 'bigger' picture (the identification of minim beats) and another with 'smaller' details (the identification of crotchet beats). Much like a Schenkerian chart, where there is a clear relationship between foreground and background, producing two sets of charts with different focuses is useful in illustrating how the intervallic movement differs when looking at the minim level to crotchet level of harmonic reduction. In calculating these movements between the pitch collections, this substitutes for a traditional harmonic analysis; the results can then aid in enriching the analytical chart.

Line graphs are then utilised to express the number of intervals between each pitch collection. The horizontal axis will represent the quantity that will change periodically with time, the bar numbers and the highlighted minim or crotchet beats, whilst the vertical axis will represent the physical quantity and the amount of intervallic movement, ranging from the smallest to the largest number of intervals. As two different Schenkerian/NRT charts will be designed, two different graphs will be required: one with the identification of minim beats and another with the crotchet beats.

One possible way to combine the Schenkerian and the 'Intervallic Movement' graphs is to plot the notes gathered from the melodic reductions on the line graphs. As there are two distinct levels of rhythmic reduction (minims and crotchets), the melodic reductions from the detailed background level analysis is inserted into the graph with the division of 'minim' beats, and the *Urlinie* from a middleground-level analysis is inserted into the graphs with the subdivision of 'crotchet' beats. Whilst observing the background-level analysis and the subdivision of 'minim' beats will provide a comprehensive view of the movement between the key chords and a comparison to the phrase structure, observing the middleground-level analysis and the subdivision of 'crotchet' beats will provide a closer view of the movement between each pitch collection within the smaller phrases.

Letter names will be added as labels on the data points, dotted curved lines act as prolongations, and solid curved lines represent neighbouring movements. Linear progressions (3-note, 4-note, and 5-note progressions) and connections between key notes will also be illustrated on the graphs. This will provide a significantly different insight: a visual representation depicting the relationship between the melodic (modified *Urlinie*) and the

[40] The modified chart, therefore, demonstrates the movement from one pitch collection to the next, the 'vertical' harmonic movement (to obtain the 'amount of movement between each chord') as well analysing the individual voice-leading movement within the pitch collections (to obtain the 'BIP').

[41] Edward T. Cone, 'Analysis Today,' *Musical Quarterly* 46, no. 2 (1960): 172–88; Grosvenor W. Cooper and Leonard B. Meyer, *The Rhythmic Structure of Music* (Chicago: University of Chicago, 1960); and Arthur Komar, *Theory of Suspensions* (Princeton: Princeton University Press, 1971).

harmonic (identified pitch collections) elements in the music. For instance, it will be particularly interesting to examine the shape of the graph when there is a prolongation of a note—if there is a significant increase or decrease in the 'amount of movement between each chord,' how does this impact one's perception of the music? Could this suggest that an additional note should be added to the melodic reduction and the Schenkerian chart? The selection of the note should also be treated carefully, but it is imperative to observe that not all additional notes need to be weighed against their connection to the melodic reduction. Other movements such as consonant skips or other skips can be added to the final Schenkerian chart if the analysis of the intervallic movement suggests that they are 'significant' (increases or decreases) and one can hear the note playing a significant role within a phrase. Thus, to obtain a truly detailed melodic reduction, particularly in the context of early twentieth-century music, the application of this NRT-inspired approach will be extremely useful. The amalgamation of this method with a Schenkerian approach enables a detailed and well-justified interpretation and analysis at a middleground-level of analysis.

Analytical Results

For the purpose of this article, only the first four bars of the Piano Sonata will be considered. The analytical results are presented in Schenkerian charts integrated with VL calculations between chords at minim and crotchet levels (Analytical Charts 3 and 5); line graphs depicting the intervallic movement and its correlation to the modified use of the *Urlinie*, the melodic reduction (Analytical Charts 4 and 6); and a presentation of the statistical data gathered from the graphs with a focus on the minim subdivision.

The discussion that follows assesses the data from the voice-leading approach with the middleground-level Schenkerian charts and asking: are there patterns in the data that seem to match features of the Schenkerian chart; and does the prolongation of a particular note in the chart correlate with a 'uniform' set of intervals in the data—a sequence of similar-sized intervals?

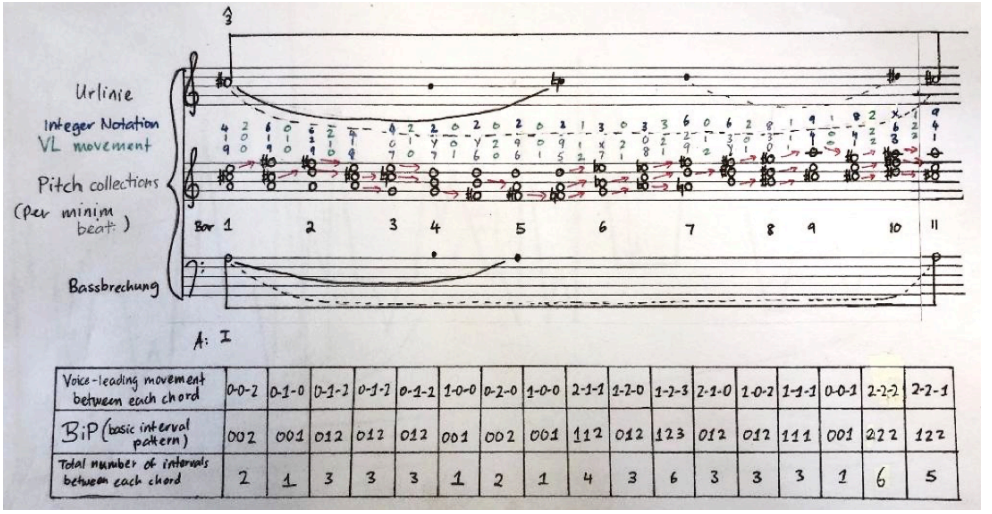
As it is evident that musical elements such as dynamics and sequences play a significant role in a listener's perception, it is therefore not sufficient simply to discuss the changes in intervallic motion based on the harmonic movement. Thus, from building upon the initial observations of various musical features that are reflected in the preliminary Schenkerian charts, suggestions can be made regarding the relationship between the data and tension, resolution, and stability. These musical features can include:

- a rise/fall in the melodic contour;
- an increase or decrease in rhythmic activity;
- an increase or decrease in dynamics;
- phrase markings; and
- motivic structures.

As a close examination of the data reveals that there are 'significant' moments—for example, one large interval among a group of small ones—that are not represented by a corresponding note in the initial Schenkerian chart, this then prompts a number of points to be considered. If there are such moments in the data that do not correlate with a feature on the chart, upon further listening to the specific phrase in which this 'significant' harmonic moment occurs, can this be heard as significant? Is the moment particularly distinct upon a closer inspection of

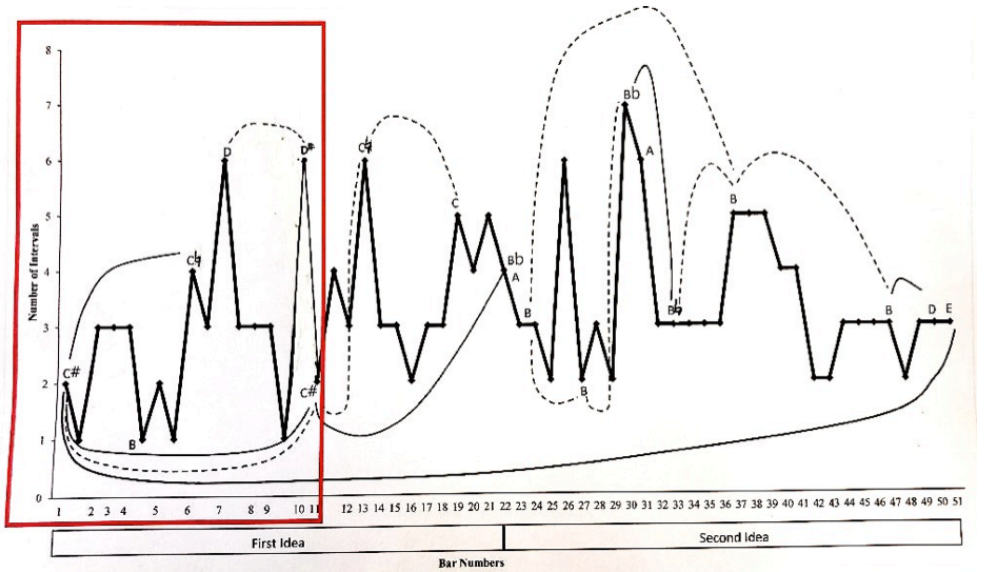
the harmonic context? If the moment can be heard as 'significant' for harmonic reasons, a note from the pitch collection could then be justified for inclusion in the final analytical chart. What will form the basis of selecting the most appropriate note? Will this be guided by Schenkerian principles such as priority to the treble and bass voices and prolongations via scalic movement towards or away from a note?

Analytical Chart 3. VL calculations with the modified Schenkerian chart (minim subdivision) for bb. 1–10

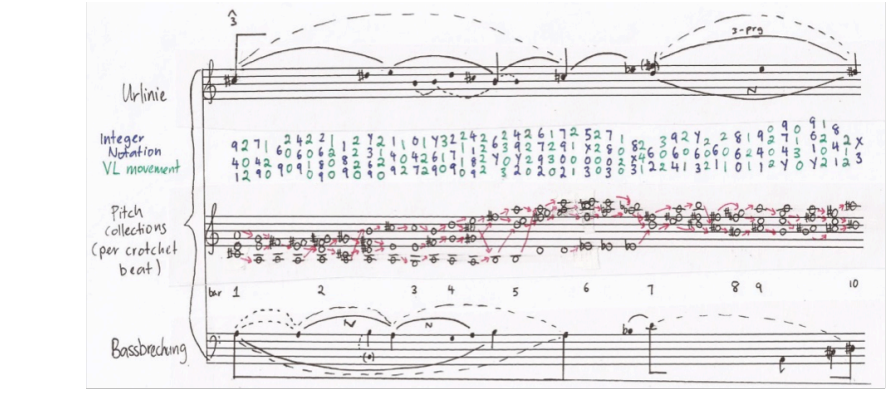


Voice-leading movement between each chord	0-0-2	0-1-0	0-1-2	0-1-1	0-1-2	1-0-0	0-2-0	1-0-0	2-1-1	1-2-0	1-2-3	2-1-0	1-0-2	1-1-1	0-0-1	2-2-2	2-2-1
BiP (basic interval pattern)	002	001	012	012	012	001	002	001	112	012	123	012	012	111	001	222	122
Total number of intervals between each chord	2	1	3	3	3	1	2	1	4	3	6	3	3	3	1	6	5

Analytical Chart 4. VL movement graphs with the melodic reduction between minim beats for the first movement (a focus on bb. 1–10)

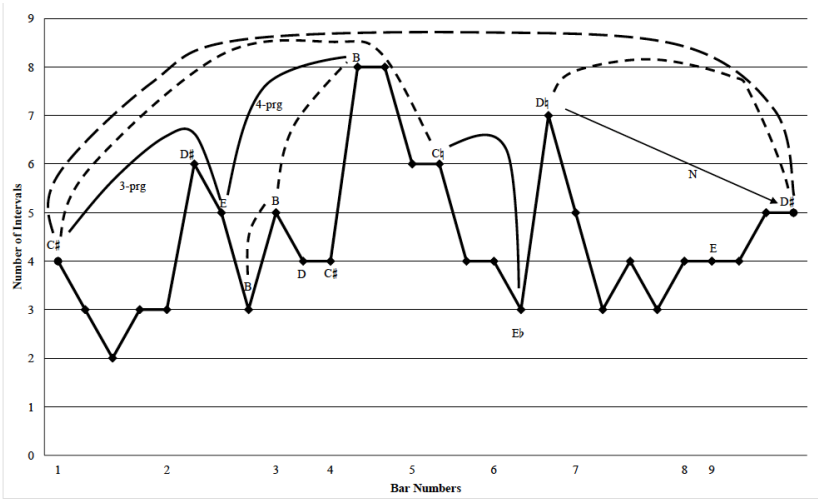


Analytical Chart 5. VL calculations with the Schenkerian chart (crotchet subdivision) for bb. 1–10



Bar	1				2				3	4			5			6			7				8	9			
Voice-leading movement between each chord	2-02	02-1	00-2	01-02	0021	0232	0212	2-01	2-21	01-3	011-2	2-222	3032	0232	0321	1-012	0022	02-01	1-12	2-03	1-02	2-02	1-02	1-21	2-020	031-0	2-021	2-12
BiP (Basic Interval Pattern)	022	012	002	0012	0012	0222	0122	012	122	013	0112	2222	0233	0222	0123	0112	0022	0012	124	023	012	022	012	112	0022	0013	0122	122
Total number of intervals between each chord	4	3	2	3	3	6	5	3	5	4	4	8	8	6	6	4	4	3	7	5	3	4	3	4	4	4	5	5

Analytical Chart 6. VL movement graphs with the melodic reduction between every crotchet beat in bb. 1–10



Calculating the number of intervals between each chord at a background and middleground-level has evidently produced different sets of data. Several observations can be made when examining the first four bars of the music to a minim level of rhythmic reduction alongside a background-level of a Schenkerian analysis.

As the overall melodic contour in the opening beats contains a descending idea, this is correlated with a decrease in the intervallic distance between the first and second chords within the first bar, which is then followed immediately by an increase. Although the second chord in the descending idea contains an E, the descending data points from 4 to 3 reinforces the fact that E is merely an embellishment and B is in fact the key note in the second beat. It can

thus be stated that in this particular instance, the intervallic decrease aligns with the melodic descent in the music. This also reinforces the idea of having a smaller intervallic change at the start of the movement as a way to establish stability. Although bars 1–4 are essentially one musical statement, they can be further subdivided into two smaller phrases: bars 1 and 2, and bars 3 and 4. These are shaped by their slur markings, and it can be implied that, within each phrase, there is a build up to a 'high' point before drawing to a close. However, the data from bars 2 and 4 depict a slight increase of intervallic distances from bars 1 to 3, suggesting more harmonic movement. The use of *crescendo* and faster rhythms also contributes to a sense of increased intensity within the two phrases. As the data point at the beginning is the same as the end of the phrase, it can perhaps be argued that these bars form one phrase and the repeated intervallic movement of bar 3 suggests that there is a relationship between the first and second subphrases.

However, upon further investigation, the number of intervals between each chord at a crotchet level of rhythmic reduction matched to the middleground Schenkerian chart yielded slightly different results. As bars 1 and 2 can also be described as an antecedent phrase to bars 3 and 4, this melodic idea ends on what may appear as an 'unfinished' chord to listeners, despite the appearance of the tonic chord, and this is supported by an increase in the data points. It can be seen that through plotting the notes from the melodic reduction against the respective data points in bars 1–2, the increase in the intervallic movement correlates with the initial three-note linear progression (3-prg): C sharp–D sharp–E. In addition, as stated in the methodology, it is plausible to make an assumption that the 'large' increase in intervals between C sharp and D sharp correlates with the tension and instability heard in the phrase. It can be perceived that there is an increase in momentum from the harmonic rhythm between the starting note of C sharp on the first beat of bar 1 to the D sharp on the third beat of bar 2. This is further reinforced by the repeated and sustained A in the bass line as well as its descending scalic figure where the arrival of B (beat 2, bar 2) coincides with the highest moment of the phrase: D sharp. The bass note B is supported by the D sharp in the melody, and without the following beat, the music feels incomplete and filled with tension without any resolution. With consideration of the following beat and its representation in the melodic reduction as E, there is a small decrease in the intervals on the graph to correlate with a fulfilled cadence, the moment of resolution of the phrase.

In the consequent phrase (bars 3–4), one can hear a decrease in the register of the melody, yet the final chord of the phrase sounds incomplete. This could act as a suggestion for performers that this phrase may be connected to the subsequent phrases, as an unresolved moment generally suggests that the phrase has yet to be formally completed. As represented in the initial Schenkerian chart, a descending four-note progression (E to B) in bars 2–4 has been identified, and this is supported by a contrasting set of data as the total number of intervallic movements between chords denotes a general increase in data points against the descending note progression.

As these four notes do coincide with the conclusion of the first musical statement, it can be suggested that there might be a decrease in the intervallic movement, correlating with the end of the phrase. This 'significant' increase of three that appears in Table 1, while challenging the notion that the approach of the end of the phrase would contain a smaller intervallic movement, could play a much bigger structural role, as the movement is driving to reach the

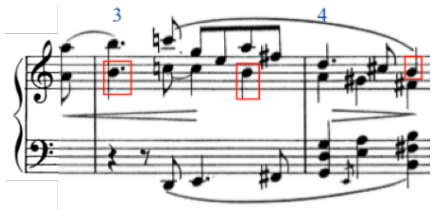
next phrase, potentially signifying that the cadential moment at bar 4 is not truly 'complete.' It must be highlighted that although the movement between each voice within a chord moves in 'smaller' steps (0, 1, 2 or 3), it is through the combination of these movements that the total distance between each chord or pitch collection is calculated.

Table 1. Total amount of intervallic movement between each chord

4-note progression	E		D		C#		B
Intervallic Movement	5		4		4		8
Individual movement		-1		0		+4	
Overall movement			+3				

The final notes of the opening statement in bar 4 (D–C sharp–B) also clearly establish a descending step progression and are supported by an increasing set of data points (4–4–8). As stated earlier, this moment in the bar suggests an end to the subphrase, yet the large intervallic movement suggests otherwise—the possibility that there is a stronger connection to subsequent bars. These data points also match the notes where the cadence comprises the 'tonic' chord (A–C sharp–E with an added G sharp to B–F sharp). This can be likened to an imperfect cadence, an incomplete moment, or as I–V in E major. These opening bars strongly establish the tonality of A, reinforced by C sharp, and, as shown on the initial Schenkerian chart, this leads to C, as one can hear the end of the first idea and the start of a new phrase. It is therefore interesting to observe the overall neighbour note movement spanning from C sharp in the first bar to C in bar 5. As shown in Example 1, the intervallic distances between the chords that surround the lower neighbour note (B) span from the beginning of bar 3 to bar 4. This is depicted on the graph as an increase that moves from 3 to 5 to 8. The role of B in this particular instance is rather interesting as it alternates from being an inner voice to an outer voice.

Example 1. Lower neighbour note (B) in bars 3 and 4



One can hear that these opening bars are incomplete, suggesting that these bars are merely an introduction, an unfinished opening statement that wants to lead to the following bars. This is supported by the findings in the graph extracted in Table 2, where the overall contour from C sharp (the first note in bar 1) to C (the third beat in bar 5) rises from 4 to 8 (B) before decreasing slightly to 5. This reinforces the idea that a higher number of intervallic movements would denote instability and harmonic movement.

Table 2. A neighbouring movement and its corresponding data points in bars 1–5

Bar	1	4	5
Neighbouring Movement	C#	B	C
Data Point	4	8	6

Conclusion

This article has demonstrated the usefulness of creating a hybrid analytical method for music that contains vestiges of tonality with post-tonal harmonic features—typical of Neo-Classical music. Some concluding thoughts are here offered on how a hybrid analytical approach to Neo-Classical music might be applied in other case studies. The great challenge of analysing Hindemith's music lies mainly in its variety of tonal procedures. We are further flummoxed by the absence of a total theory that incorporates the differing and contrasting layers of neo-tonality, symmetrical phrasing and harmonic fluctuation of the kind Hindemith describes in his writings. But it is even more challenging to have a method that attempts to make insightful observations without overlooking important features, such as melody and harmony. Through the study of Hindemith's Piano Sonata no. 1, we ascertain that the Schenkerian method is still applicable as the background harmonic structure is somewhat tonal. However, as the foreground harmonies are post-tonal, other analytical approaches are more useful to understand these structural aspects better. One such approach is NRT. Therefore, by integrating the analytical strengths of the Schenkerian and Neo-Riemannian methods, we are in a stronger position to understand post-tonal foreground harmonies and tonal harmonic structures in a piece such as this.

Whilst it is impossible to have one methodology to explain *all* musical features, a synthesis of certain aspects of the selected methods has helped construct a more thoughtful and strategic approach to Neo-Classical music. Whilst Schenker's principles of identifying certain melodic features—such as prolongation—and the fundamental structure are useful in illustrating the expansion of the harmonies, unconventional intervals will emerge from the *Urlinie* and *Bassbrechung*, and it is challenging to analyse the harmonies via traditional Roman numerals. As Hindemith's music contains strong vestiges of tonality, Schenker's principle of linear progression and Hindemith's own melodic principles have yielded very similar results. However, if strict Schenkerian principles are practised, much of the distinct pitch activity might be overlooked or marginalised, and it would be beneficial to extend his principles to better reflect the movement within the music. Tonal coherence can therefore be established through motivic connections between the music of different key areas as well as the unfolding of the tonic triad. As NRT rejects monotonality but rather focuses on the transformation from one chord to the next, and that all tonal regions and chord spaces are given an equal status, this approach has been of benefit in elucidating these post-tonal foreground harmonies.

It can also be challenging to construct an analytical approach free of a schematic process and not simply justify chromatic events as an elaboration of or 'distortion' from a diatonic structure. Due to the variety of tonal procedures, there appears to be a need for a theoretical model that can explain all the similarities amongst works that are commonly described as 'Neo-Classical.' It may well be the case that what binds these works is their tonal background structure combined with post-tonal foreground harmonies. Through the analysis of Hindemith's Piano Sonata no. 1, it can be observed that despite the use of extended harmonies in the foreground details, what unifies each individual movement and the entire sonata is its tonal background structure.

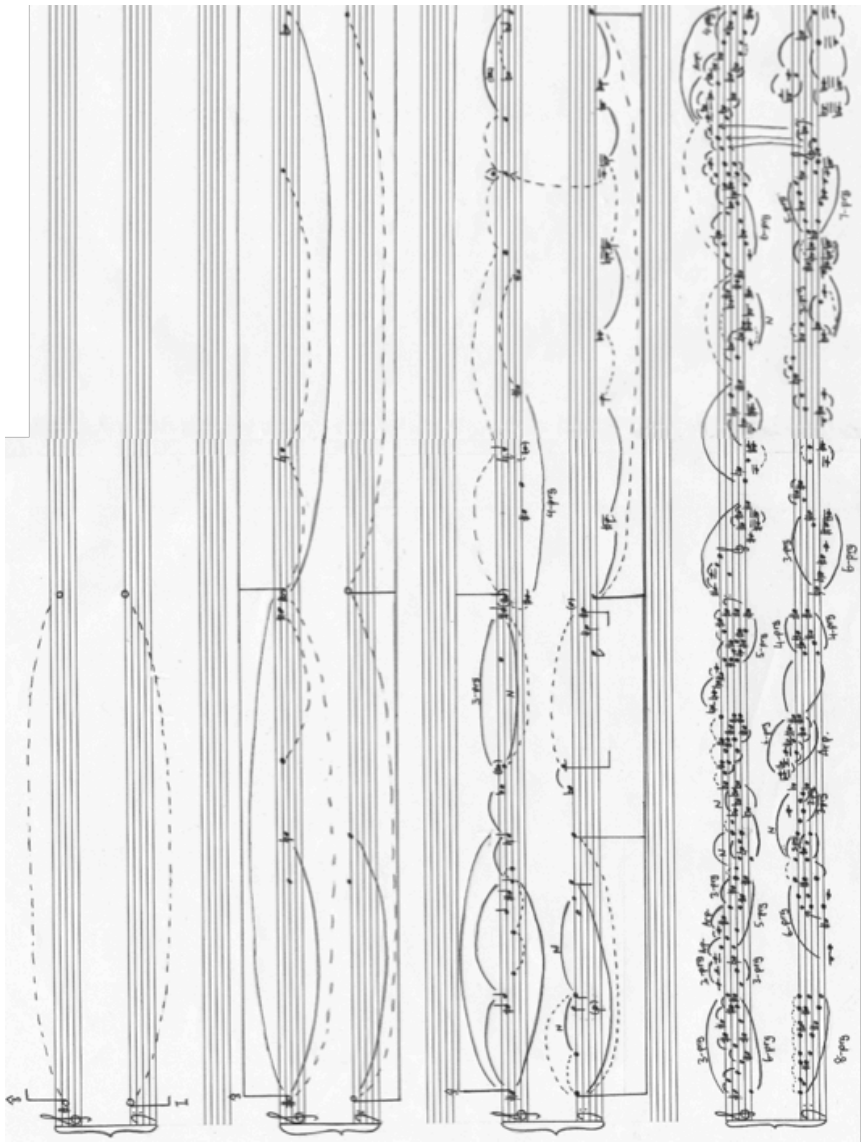
As this particular method combines both harmonic and melodic analysis, exploring the relationship between analysis and performance could be a step that can be taken in future work, performing the analysis in conjunction with analysis of recordings. Performers might find this approach useful in uncovering the functional processes and motivic ideas and in

exploring the relationships these have with articulation, dynamics and expression. It is hoped that this analytical approach might become a tool that will be useful not only for analysts but for performers as well.

About the Author

Yvonne Teo is currently a PhD student in Music Theory at Durham University. She holds a first-class honours MMus degree in Musicology (2017) from the University of Melbourne, and a first-class honours BMus in Musicology (2014) and GDipEd (2015) from the University of Queensland. Her research interests include music theory, analysis, performance practices and music perception.

Appendix A. Foreground, middleground, background sketches of bars 1–22 of the First Movement



Appendix B. Foreground, middleground, background sketches of bars 23–51 of the First Movement